

AUTOMOTIVE INDUSTRIES

VOLUME 59

Philadelphia July 7, 1928

NUMBER 1

Wide Range of Topics Covered at S. A. E. Summer Meeting

*More than 800 members and guests at Quebec sessions last week. Strickland of Cadillac slated for presidency.
Many British engineers in attendance.*

By Norman G. Shidle

THE legislative situation as regards brake hook-ups, description of a new electrical engine indicator, application of front-wheel drive to stock cars, and analysis of various methods of obtaining greater power from a given engine were among the important technical features in the foreground at the summer meeting of the Society of Automotive Engineers held at Chateau Frontenac, Quebec, Can., June 26 to 29.

Individual springing of wheels was another topic that provoked some argument at one of the sessions, while ground gears as related to transmission design, simultaneous inspection and correction of gears in production, trends in European passenger car design, poppet valve spring design, new fuel supply systems, beauty in body lines, and fuel research were other topics which had the attention of those attending the technical sessions. Motor coach operation was treated in a single session.

More than 800 members and guests were registered for the meeting, but the average attendance at the technical sessions was usually small. The golf, tennis and similar sports activities were hampered considerably by unfavorable weather conditions.

William R. Strickland, assistant chief engineer, Cadillac Motor Car Co., was nominated

to be president of the society for the year 1929, while Edward P. Warner, Assistant Secretary of the Navy for Aeronautics, was chosen as first vice-president. Nominations for the second vice-presidencies were: O. C. Berry, motor car engineering; E. N. Sawyer, tractor engineering; Victor W. Kleisrath, marine engineering, and J. B. Fisher, stationary internal combustion engineering. Walter T. Fishleigh, James A. Moyer and Orrel A. Parker were nominated as members of the council for the years 1929-1930. Continuing on the council will be E. W. Tempchin, J. W. White and F. G. Whittington. C. B. Whittelsey was again nominated for treasurer.

An informal meeting of representatives of the associations interested in tire standardization was held to discuss means of furthering the tire size simplification program recently approved by these organizations. It was agreed to invite the representatives of all of these associations to meet four times a year for the purpose of discussing the existing status of the simplification program and of devising ways of carrying forward that program in the future.

The question of raising Society dues to \$20 a year to include section membership and the possibility of realigning the organization structure of the Society to give more adequate representation to growing func-



William R. Strickland, nominated for president of the S.A.E. in 1929

tional groups were argued at some length at a meeting of the constitution committee.

The golf tournament turned out to be an enjoyable and successful affair in spite of the almost consistently inclement weather, the distance of nine miles between the hotel and the golf course, and a course suffering from the effects of too recent snows. The championship flight was won by J. B. Shea of Cleveland, who broke all golfing precedents by winning a match play tournament after having been low scorer in the qualifying round. In the finals he defeated M. R. Wolfard 4 and 3. Herbert Chase and J. P. Nikonow were finalists in the men's singles of the tennis tournament; their match will be played off at a later date.

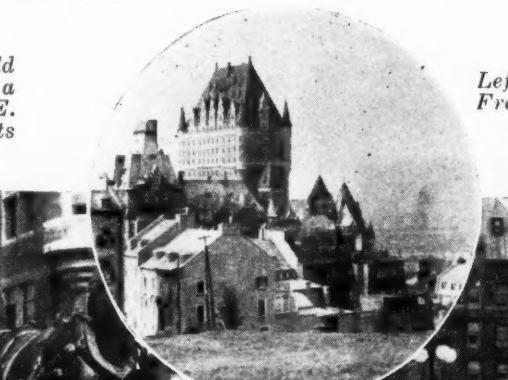
The country fair at which each section had a booth, held on the opening night of the meeting, turned out to be one of the most successful innovations in a number of years.

A number of members of the British Institute of Automobile Engineers were guests of the society. Heading the delegation of British visitors was Maj. E. G. E. Beaumont, president of the I.A.E., who outlined the progress of automotive engineering in England in a talk made at the opening session and who discussed British experience in motor transport operations at a relatively informal transportation session.

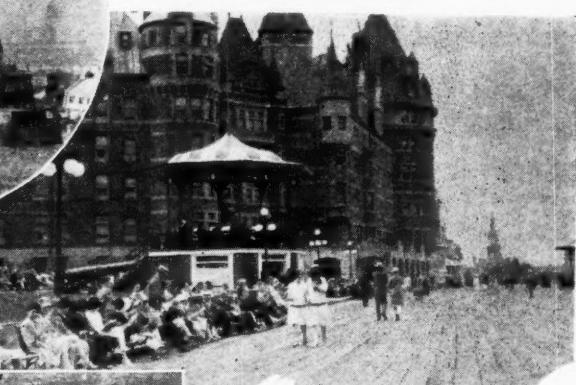
Below—In Russia this rig would be called a droshky, but it's a caleche in Quebec. Some S.A.E. members found fault with its spring suspension



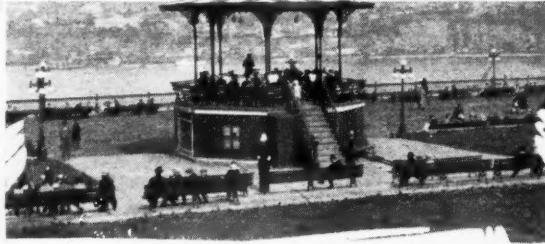
Right—Bandstand and plaza on the boardwalk, overlooking the St. Lawrence



Left—A view of the Chateau Frontenac, where the Summer Meeting was held

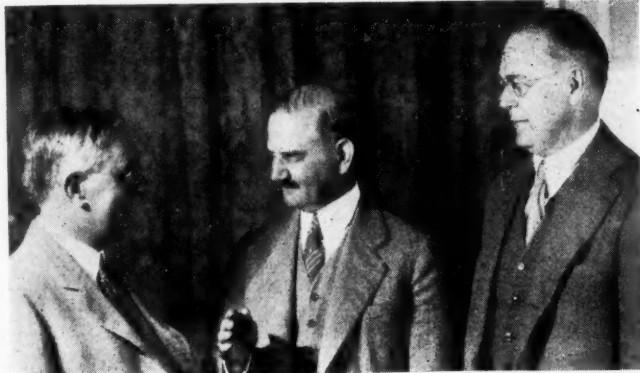


Above—The boardwalk fronting the convention hotel was a popular promenade



Orrel A. Parker (left), president, Parker Wheel Co., is a new member of the S.A.E. council

Right—A trio of general managers: M. L. Heminway, general manager of the M. & A.M.A. (left); Alfred Reeves, general manager of the N.A.C.C. (center), and Coker F. Clarkson, general manager of the S.A.E.



E. P. Warner, Assistant Secretary of the Navy for Aeronautics, was nominated as first vice-president of the S.A.E. for 1929. He flew to and from the meeting in the Navy plane shown above

Engineer is Analyzed as Business Man at General Session

Outline of industry's achievements during past year given by President Wall and Major Beaumont talks on British practices.

By A. F. Denham

A NEW note in S.A.E. papers was struck at the General Session in a paper presented by Norman Shidle, directing editor, Chilton Class Journal Co. Dealing with the subject "The Engineer as a Business Man," Mr. Shidle pointed out that the inferiority complex seems to be more prevalent in the engineering profession than elsewhere and that it manifests itself in either bluster or "passing the buck."

In his opening address, President W. G. Wall of the society, gave a brief outline of the automotive industry's achievements during the past year, including actual advances, developmental research, and aeronautics.

Following President Wall, Maj. E. J. Beaumont, president of the Institute of Automotive Engineers (British), discussed the relation or points of difference between British and American engineering practice. The technical part of the meeting was brought to a close with the showing of Baron Shiba's high speed motion pictures of air flow, described some time ago in these columns.

Among the various features which President Wall cited as having been improved during the past year in motor vehicles were valves, cooling systems, clutches, brakes, seat cushions, manifolding, and combustion chambers. In addition to this, Mr. Wall indicated that research had now almost reached the production phase on such items as front-wheel drive, superchargers for passenger cars, two-cycle engines plus superchargers, light Diesel engines and hydraulic valve gear for higher valve lift.

Among the outstanding developments in aeronautics, Mr. Wall enumerated: All-metal planes, or at least planes with metal spars and ribs predominating; the recurrence into favor of the monoplane type, and the development of air-cooled engines and their practically universal acceptance in at least the smaller sizes. He emphasized the need for developing interest in the question of maintenance and operation on airplanes as well as motor vehicles.

Differences between European and American engineering practice are more apparent than real, according to Major Beaumont's address. Europe's

outstanding contribution is the high-speed engined fast light car of high efficiency.

Mr. Shidle said, in part:

"The assignment of this topic—'The Engineer as a Business Man'—indicates the feeling on the part of somebody that there is something the matter at least with some engineers as business men. One thing that engineers, like most other human beings, are pretty much afflicted with, is an inferiority complex; but engineers often seem to be just a bit more afflicted with it than anybody else.

"This inferiority complex seems to manifest itself in two ways. In some it manifests itself by making the man bluster into all sorts of situations, throw out his chest and say, 'That is right,' and 'This is wrong, we must have it this way'; by making him try to push himself all the time in a more or less unpleasant, aggressive manner. The other way it manifests itself, is perhaps by making him say, 'If the management didn't ride me this way,' 'If my style wasn't always being cramped,' 'If the sales department would only do this. My! what a great job I could do in this organization.'

Difficulties to be Expected

"If the men on the engineering staff can once get out of their heads the idea that the difficulties which they meet in the ultimate performance of their jobs are surrounding factors which hedge them in and simply assume that these difficulties, and the overcoming of these difficulties, are just a normal, every-day routine part of their jobs, they will begin to accomplish something.

"Things come up almost every day which, the engineer believes, hamper him or cramp his style. If these things continue to cramp his style over a period of years, the fault is not that of the sales department, not that of the management, not the fault of anybody else in the company except the fault of the engineer himself. Because the perfecting of conditions under which he can fulfill his greatest mission is an integral part of the engineer's own job.



President W. G. Wall presided at the General Session and made the opening address



Norman G. Shidle, whose paper dealt with the engineer as a business man

"He has got to be a salesman within his own organization, and if he is a poor salesman he isn't capable of being the best engineer. If he isn't capable of selling his ideas, he isn't capable of getting his ideas across to the rest of his organization. Just in so far as he fails in that, he fails in a certain part of his fundamental engineering function, because all the abilities in the world aren't worth anything unless one gets an opportunity to exercise them. An engineer's good ideas are just so much sound and fury until he can, by the force, perhaps, of his own personality, of his own participation in the management viewpoint, get those ideas agreed with by those who are superior to him, or working with him, or even under him in the organization. Every idea has to be sold. When the engineer fails in his selling effort, there honestly isn't anyone to blame but the engineer himself.

Inarticulateness Hampers Him

"The relative inarticulateness of engineers, for instance, is proverbial; the extent to which it hampers the progress of individual engineers is not, however, so well understood. To be able to express one's self in writing and in words has become almost an essential to success in modern industry with its large scale organizations and the resulting necessity for the meeting of many minds on complex problems. To be effective in modern industry, most ideas have to be transferred from one mind to many; only the simplest ideas can be so transferred by means of a blueprint alone. When an engineer fails to impress his organization with a program or a design which he firmly believes to be sound, the fault lies, more often, in the inability of the engineer to express effectively what he has in mind than in the inability of other minds in the organization to understand properly.

"A man told me something one time which holds true, I believe, for almost every man down the line in the engineering organization of an automotive company. If these men only realized, he told me, that their progress, that their possibility for service as engineers, that their opportunity for advancement in an organization depends 75 per cent, perhaps, on their actual ability as technicians in performing strictly engineering functions, and 25 per cent on the general impression which they make in the organization—the general impression concerning their judgment, concerning their reaction on management problems, and so on—it would make it very much easier for their immediate superiors to broaden the scope of their activity and to permit their further development. Many times a highly efficient man somewhere in the engineering department makes it very hard for his superior to broaden the scope of his activity because he has failed to realize the necessity for contact in the organization, the necessity for trying to understand management problems as well as strictly engineering problems.

"From now on it would seem clear that engineering



Among those entering the discussion at the General Session were John Younger (left) of Ohio State University, and J. A. C. Warner of the Studebaker Corp. The latter also is chairman of the S.A.E. Meetings Committee

thinking must be business thinking; the engineer must tend to think as a business man; he must not consider his division a water-tight compartment whose business it is to preserve the sanctity of at least one small part of this particular business of manufacturing. To the contrary, he must consider himself an integral part of the picture. He must expect, in so far as his ideas are good, that he must get them across. He might as well recognize when he fails that there is something wrong with him, instead of figuring that when he can't get his ideas over there must be something wrong with everybody else.

"As the engineer begins to get this business aspect into his thinking, he is going to put himself into a positive mode of thought rather than into a negative one.

"We have all heard of automobile designs that are not taking with the public. Such a thing as unpopularity for a given design is not an unknown thing. If you have ever watched closely the engineering set-up of an organization whose current design is not taking well, haven't you been impressed with the wonderful lot of suggestions that the engineering department begins to get from the whole organization? The chief engineer gets a flock of suggestions as to what ought to be done; and very frequently they come from places in the organization where they must be followed out, once they are made. That isn't the time to start your selling; at that time you are on the defensive; at that time you are backing up already and the most you can do, perhaps, is to win the argument and lose your job.

Suggestions From All Sides

"Suggestions sometimes come from some element of the business that hasn't been so close to the engineering problem as the engineer himself has been. The engineer feels annoyed and irritated. 'My heavens, how can you do that? What good will it do anyway?' he says to himself. He gets into a kind of whirlpool of argumentation. I pity the engineer, who is in an engineering department when it is slipping, who isn't taking a very positive and constructive mental approach to his problems, because that department, as I say, gets an undue lot of suggestions from many sources. This is quite natural, however, because everybody is trying to think of something that will do the job. Now, where the engineer can think ahead, where he can see his engineering policy in terms of that business problem—because after all, the problem of the engineer is to get his company back on its feet so that it can make money—if he can see his engineering problem in terms of that basic business which provides not only his job but his opportunity for service, then he is going to be able to evolve certain ideas which he feels are constructive and certainly ideas under which he will be able to work much more enthusiastically and much more constructively, perhaps, then he could if he simply sat back and waited for ideas and suggestions as to how to get things done from a business standpoint."

Discussion centered chiefly about Mr. Shidle's paper. F. C. Horner disagreed to the extent that he did not believe most engineers suffer from an inferiority complex, or were relatively inarticulate, but agreed that many good engineers fail to make good with the management because they cannot or will not try to see the management's viewpoints. T. J. Little, Jr., added to this that the consideration of the engineer from a business standpoint, made necessary by modern developments, arouses considerable petty jealousy in certain organizations. Mr. Little stated that he believed most engineers were "fog bound" in that they would not read or discuss anything except that connected with their own profession. He thought they should have a better general knowledge in order to get a broader outlook on life.

Prof. John Younger's comments dealt with the importance of personality in organization contacts, pointing out that the whole question was merely one of applying practical psychology. As regards the need for greater engineering application to economics, Mr. Younger recalled the problems faced by the tire industry with the great multiplicity of balloon sizes called for by different engineers for virtually the same load conditions.

A written discussion on Mr. Shidle's paper was pre-

sented by C. A. Musselman, president, Chilton Class Journal Co., who pointed out the necessity of being able to see both sides of a subject, the genius from this point of view giving way gradually to the man of balance.

J. A. C. Warner, Studebaker Corp., gave an interesting side-light on this question from a personal experience of a three months' trip with the sales force of his organization, the sales force feeling that the engineer was not expected to be able to talk.

Among others to discuss this paper were Alfred Reeves, Automobile Chamber of Commerce, who stated that selling cars was now in the hardware or millinery class; J. H. Hunt, past-president of the society, who said that failure to make the needed organization or outside contacts was an evasion of responsibility on the part of the engineer; E. P. Warner, Assistant Secretary of the Navy for Aeronautics, who stated that one of the primary needs for the engineer is the understanding of the application and probable market of the product, except possibly in pure research; H. M. Crane, General Motors Corp., who defined engineering as trained common sense with a background of technical information, and Water T. Fishleigh, Ford Motor Co., who emphasized the need for a broader primary training for the engineer.

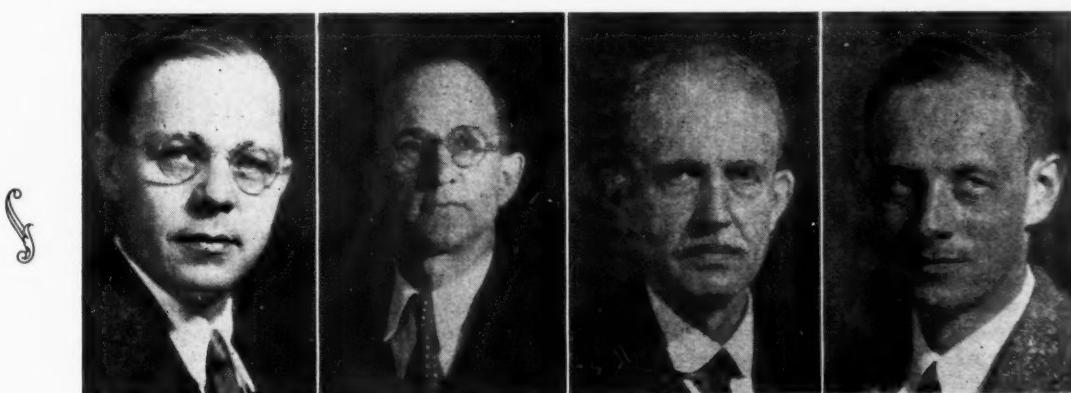
State Officials and Engineers Discuss Brake Situation

Subject viewed from all angles at Chassis Session. T. J. Little speaks on engine output. Suspension in Europe, Franzen's topic.

WITH the current intense interest concerning the legislative four-wheel brake situation, a particularly timely discussion which proved quite animated brought out at the chassis session the viewpoints of legislators and chassis engineers on this important question. The subject was introduced by Prof. E. H. Lockwood of the Sheffield Scientific School in a paper entitled "Legislation on Automobile Brakes," prepared by Professor Lockwood and his associate, H. W. Best. Written discussions on the subject were presented by

G. L. Smith of the United States Ordnance Co. who spoke on "Brake Power in Relation to Safety;" Benjamin G. Eynon, registrar of motor vehicles for Pennsylvania, who took up the subject from the law enforcement angle, and John F. Griffin, commissioner of motor vehicles for New Hampshire.

A paper on "Methods of Obtaining Greater Power from a Given Engine," by T. J. Little, Jr., chief engineer, Marmon Motor Car Co., also aroused considerable discussion, especially from the point of view of the



Left to right: Tore Franzen, Detroit Steel Products Co.; George L. Smith, United States Ordnance Co.; E. H. Lockwood, Sheffield Scientific School, and B. B. Bachman, chairman of the Chassis Session

actual availability of power under driving conditions.

The necessity of improving or varying spring suspensions for cars shipped to Europe, where road conditions are poor at present, was emphasized in a paper entitled "European Roads and American Cars" presented by Tore Franzen, Detroit Steel Products Co. B. B. Bachman presided.

Proposed Law Has Flaw

Professor Lockwood's paper dealt chiefly with the history of brake legislation, evolved in the days of relatively less efficient two-wheel brakes and the anomalous situation created by the fact that some efficient four-wheel brakes violate existing laws while relatively less efficient two-wheel brakes are within the law. In discussing the proposed law drafted by the Eastern Conference of Motor Vehicle Administrators, Professor Lockwood points out that the clause which states "If the brakes are connected together in any way they shall be so connected that failure of any one part of the operating mechanism shall not leave the automobile without brakes on at least two wheels," is open to the same objection as previous legislation requiring two entirely independent braking systems.

In his analysis of the brake design situation, Mr. Smith took the matter up from the efficiency angle, pointing out the relative in efficiency of the four-wheel brake over that actually possible by the full use of the entire car weight and its distribution during deceleration, reduction of equalization errors by torque equalization, etc. Simplification of the entire braking system by using a transmission brake instead of rear wheel drums with separate hook-up to emergency lever was also suggested.

Leading off the discussion, J. A. C. Warner of the Studebaker Corp. discussed some tests on a well-known braking system which roughly has a single cross-shaft mounted in two brackets, and tie rods to front and rear wheel brakes from each end. He stated that the only way in which this system could be put completely out of commission was to break the cross-shaft simultaneously to the left of the foot pedal and the right of the hand lever connections. Provided the cross-shaft was of strong design, Mr. Warner said it might be just as necessary to have two independent steering gears.

Band Wear Causes Failures

In replying to Mr. Warner, W. R. Strickland stated that one of the worst causes of brake failure was wear of the bands. Taking up the subject from the truck angle, M. C. Horine pointed out the necessity for two different brake assemblies. In heavy vehicles heat is an important factor, Mr. Horine pointed out. This is especially true in hilly country where prolonged application of brakes causes the drums to heat and burn the lining, making the availability of a second set of drums an absolute essential. He also stated that he believed the trend was away from brake equalizers, since these failed to achieve their purpose and involved a decrease in the safety factor of the entire system.

John Younger agreed with Mr. Strickland on the importance of the lining question, saying that some nationally advertised linings become almost entirely ineffective in wet weather. F. G. Whittington of the Stewart-Warner Speedometer Corp. agreed with Mr. Horine that "equalizers" are not as necessary as "compensators."

Mr. Franzen's paper was based on a three months' investigation in Europe of car suspension problems, with particular reference to "striking through." Many

European owners, he stated, use low tire pressures in order to obtain comfort, but these introduce front-wheel shimmy. Over-oiling of springs and shock absorbers is another common fault in Europe, making it advisable to make friction type shock absorbers fool-proof. It should be possible, according to Mr. Franzen, to easily work out a special suspension not radically different from the present for export cars.

This subject, which Mr. Strickland pointed out applies also to many parts of the United States where roads are deteriorating, introduced the question of independent wheel springing. Messrs. Herbert Chase, J. W. Saffold, Lee Oldfield and J. A. Anglada, giving their views on the necessity or desirability of departing from what they characterized as a "wagon spring" suspension. Mr. Strickland questioned whether independent springing would stand hard usage over as long periods as present systems. Mr. Franzen, in summing up, admitted the possibilities of independent springing, and also possibly gaseous suspension, but stated that he believed it would prove rather expensive. The use of semi-elliptic springs is due to their ease of application to any type of car, but should not be called wagon springs, as materials, etc., are much better now than formerly.

Increasing Engine Power

In his paper on increasing power in a given engine, Mr. Little analyzed the various factors which might contribute to such an increase without complete redesigning. Supercharging was suggested as an additional optional method.

Mr. Chase pointed out, in the discussion, that it was not the maximum power of the engine itself which is important from the car performance angle, but the instantaneous availability of such power, especially for rapid acceleration. In a short discussion on high *versus* low speed engines, Mr. Anglada stated that the chief objection to the high-speed engine has been on the basis of its supposed shorter life, and that better lubrication, from study of results in aircraft engines, for instance, should aid materially.

Reference to the two-cycle engine was made by Mr. Oldfield as a means of increasing power. One engine under test at present, according to him, has run at 85 r.p.m. and no load without missing, thus indicating that the idling troubles of the two-cycle engine are not impossible of solution.

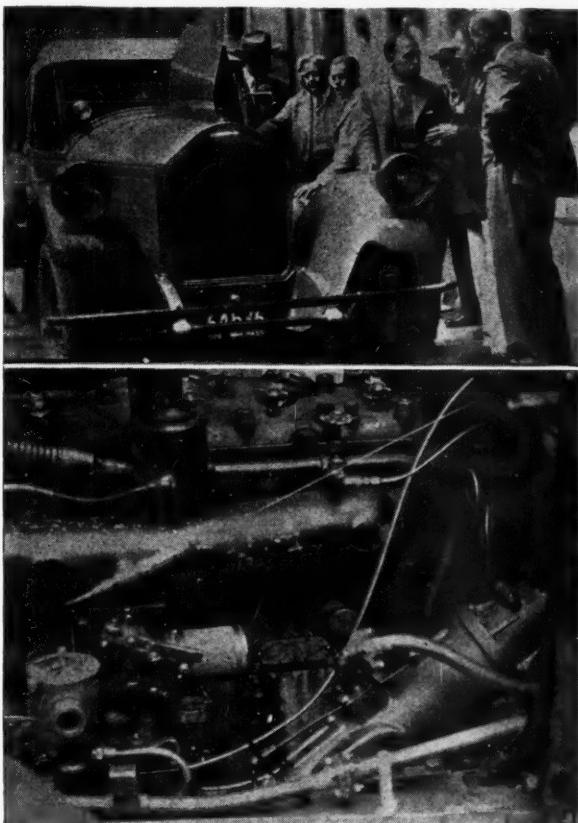
Mr. Little admitted the possibilities of the two-cycle engine referred to, in summing up, and also pointed out that the low-speed engines of today were the high-speed engines of a number of years ago. Racing cars, it should be remembered, have engines turning up over 7000 r.p.m. in this country and as high as 11,000 in Italy, he said.

Brake Legislation— Lockwood and Best

IN their paper on "Legislation on Automobile Brakes," Messrs. Lockwood and Best reviewed the development of motor vehicle brakes and present legislation with respect to the latter. Present laws, they said, were based for the most part on conditions when the majority of cars still had brakes acting on the two rear wheels only and are not suited to present conditions. The provision which has given the most trouble is that the two braking systems called for shall be independent of each other. Changes designed to adapt the

laws to existing types of equipment are now under consideration, and the Eastern Conference of Motor Vehicle Administrators has drafted the following proposed brake law which is said to have been already adopted by several States within the conference:

"Every motor-vehicle operated in or upon any public highway in this State shall be equipped with brakes



The upper view shows F. W. Davis' Pierce-Arrow demonstrating car with hydraulic steering gear in the court of Chateau Frontenac. Below—View under the hood of the car, showing steering gear housing and oil connections to same. The oil pipes seen in the foreground lead from the steering gear to a brake booster and back to the oil pump, which latter is driven by the front end gears of the engine

adequate to control the movement of and to stop such vehicle. Every automobile so operated shall be equipped with at least two braking systems, with two separate means of application, each operating on at least two wheels and each of which shall suffice to stop the vehicle within a proper distance. If these two systems are connected in any way, they shall be so constructed that failure of any one part of the operating mechanism shall not leave the automobile without brakes on at least two wheels. One of these systems shall be so constructed that it can be set to hold the vehicle. All such brakes shall be maintained in good working order and shall conform to regulations not inconsistent with this act to be promulgated by the commissioner of motor vehicles. Every motorcycle shall be provided with at least one brake, which may be operated by hand or foot."

The authors of the paper listed the following factors as contributing to safety in use of the automobile brakes:

1. To provide for stopping in the shortest possible distance without dangerous skidding
2. To have a suitable set of brakes for holding the vehicle stationary

3. To build the brake mechanism so that fracture or separation of working parts will be practically impossible

4. To have convenient means of adjustment so that injurious effects of wear can be removed promptly

5. To protect parts against impairment of effectiveness by weather

In the proposed law complete separation of the two brakes is qualified by the clause that, if the two systems are connected in any way, they shall be so constructed that the failure of any one part of the operating mechanism shall not leave the automobile without brakes on at least two wheels. Such a qualifying clause is difficult of interpretation, and the practical outcome might be the requiring of complete separation of the two braking systems, thus substantially reenacting the objectionable feature of the existing law.

One argument in favor of the clause is that some safeguards are needed against future cheapening of brake equipment, with a resulting lowering of safety standards. To this the authors reply that in the essential units of the automobile, such as braking and steering parts, such safeguards hardly seem necessary since the self-interest of the manufacturer in maintaining public confidence in his product will operate more powerfully than any law.

Greater Engine Power— *T. J. Little, Jr.*

MR. LITTLE said the general methods of increasing engine output were as follows:

1. Increasing the speed
2. Increasing the volumetric efficiency
3. Increasing the compression ratio
4. Increasing the thermal efficiency
5. Increasing the mechanical efficiency

Although some engineers are adverse to increased engine speeds, Mr. Little said he believed that progress lay in that direction. Greater care must be used in manufacture, much more attention must be given to the balancing of all moving parts, better materials must be used, and the valve springs especially constitute a knotty problem, but a great deal of material can be saved by increasing the speed. Weights of all reciprocating parts should be reduced, including those of the valve gear, and there is a possibility of lighter materials coming into use, such as beryllium for pistons. Piston pins can be tapered out from both ends, and crankshafts bored out to remove the comparatively inactive material at the center of the sections. Recent ingenious machines permit of doing this in simple operations.

New types of front-end drives, used with sprockets made by die casting, permit of saving some weight. Steel stamped pulleys for generator, fan and water pump drives are used both for lightness and economy.

Mr. Little referred to a new type of vibration damper, which he believes, will replace the old flywheel-type of damper. It is a multiple-purpose device and will save considerable weight and cost, besides which it will take care of all the critical periods of the engine.

Volumetric efficiency can be increased by increasing the valve diameter and lift. It has been supposed that a lift of one-quarter the clear diameter gives maximum valve capacity, but recent tests have shown that the capacity increases with lift up to one-half the diameter. Inventors now have worked out a hydraulic valve-operating mechanism, working on the differential piston

principle, which bids fair to make a greater lift practical, and at the same time to make valve operation more quiet. With an increase in engine speed the inlet valve opening period must be increased, as a rule. Redesign of inlet manifolds to give smoother flow has led to material increases in power output, and the use of dual carburetors in some instances has had a similar effect. Cold carburetion is being studied carefully for its effect on the volumetric efficiency, and a considerable power increase may be expected from it. Exhaust back-



Edward S. Marks (left), chief engineer, H. H. Franklin Mfg. Co., and F. Sergardi, engineer, Reo Motor Car Co., were much in evidence at the technical sessions

pressure can be reduced by passing the exhaust through the center of the muffler.

With the non-detonating fuels now available the compression of engines can be increased. However, the combustion chambers will have to be redesigned in many cases, and zones of low turbulence eliminated. Metals of higher thermal conductivity than cast iron, when used in the cylinder head, will result in better cooling. The spark plugs may have to be relocated, and a better designed plug used. Multiple spark plugs result in an increase in power, particularly with large cylinders.

An automatic method of controlling the inlet temperature would be an advantage, as little heat is needed in the upper range of engine performance. In many engines there are local hot spots in the cooling system, and Mr. Little said almost all engines that had come under his observation had restrictions in the path of flow around the exhaust valves, the inlet valves or the spark plugs.

Under the heading of increasing mechanical efficiency Mr. Little referred to the development of Nitralloy, and to the need for better lubrication by careful filtering of the oil, of careful bearing fits, so the bearings can be moved or rotated freely by hand, and of prolonged heat treatment of aluminum pistons. Anti-friction bearings, which are now being successfully used in aircraft engines, may come into use on higher grade cars, and a further gain can be made by cutting down the friction losses in all of the accessory units.

European Demands— *Tore Franzen*

MR. FRANZEN, dealing with road conditions as they exist in Europe and the relation between these conditions and the designing of the suspension

for cars to be exported to Europe, said, in part:

"Complaints of spring failures and especially of 'striking through,'" received by some of our customers who export the larger and more luxurious automobiles, were the direct cause of the investigation of the conditions mentioned. The trip was limited to three months and this survey is, therefore, not complete. It included Holland, Belgium, France, Germany, Austria Hungary, Jugo-Slavia, Czechoslovakia, Sweden and Switzerland.

"It does not require a great deal of research, to find that the cause of the European motorist's troubles are not springs, but roads.

Maintenance Poorly Organized

"I would not have you think that Europeans are not interested in better roads, but do want to emphasize that road maintenance, in most cases, is not organized on nearly so sound a basis as it is in practically all parts of the United States. To illustrate: In most sections of Continental Europe the peasant whose property lies along the highway is responsible for the maintenance of that particular stretch of road.

"These roads could perhaps be divided roughly into two types: the old stone roads and the dirt roads. The stone roads, which in many cases date back to the time of the Romans, while remarkable for their durability, are not very suitable for automobiles because they are extremely rough, relatively narrow, highly crowned, and the surfacing is mostly cobblestones or stone slabs. The dirt roads are like the soil around them, mostly deeply rutted and extremely rough when dry or frozen.

"It is common knowledge that only relatively wealthy Europeans buy American cars selling here for \$1,000 or more. These motorists can be divided roughly into two classes: First, there is the sportsman who drives his own car and gets a great deal of pleasure from speeding over poor roads; the second type of motorist wants to travel in comfort and safety and his car is invariably chauffeur-driven. Such owners frequently use very low tire pressure to avoid annoying vibrations resulting from choppy roads. Actually, the results are not so gratifying as might be supposed, because low tire pressure is accompanied by relatively high spring-deflection and severe jolts are experienced when deep ruts in the road are encountered. Naturally, greater disturbances occur in the steering-gear, and shimmy often results. It is, therefore, obvious why scientific research on automobile suspension in Europe seems to be concentrated on correcting shimming rather than improving riding comfort.

"The demand for quietness in the more expensive automobiles is very strong. Consequently, slight noises in the running-gear, squeaks in springs, and grunts in shock-absorbers are quickly detected and the owners immediately make serious complaints. Thin oil is regarded as a universal remedy for such annoyances. With over-lubricated springs and the conventional drum-type of friction shock-absorber filled with oil, striking through is the result. Complaint is then made that the springs are weak.

"In our highly specialized automobile factories here, or in the depot shops of our plants in Europe, it would, perhaps, be relatively simple to develop a special suspension for use in sections of Europe where the car population is large enough to warrant it. Such suspensions would deviate but little from ours, so far as springs are concerned, but particular attention would have to be paid to shock-absorbers."

Front Wheel Drive Paper Features Transmission Session

Types divided into three classes in exposition by Herbert Chase. D. Sensaud de Lavaud's paper is read by title only.

By P. M. Heldt

ONLY one paper was read at length at the Transmission Session on Thursday afternoon, that by Herbert Chase on "Front Wheel Drives." W. T. Fishleigh acted as chairman of this session. A second paper scheduled for the session, on the "Sensaud de Lavaud Automatic Transmission," by D. Sensaud de Lavaud, was read by the title only, as, contrary to expectations, the author did not attend the meeting.

Mr. Chase, in his paper, divided front wheel drives into three classes. The first comprises an axle very similar to the rear axle of ordinary vehicles except that there are steering knuckles at the ends and universal joints are incorporated in the driveshafts concentric with the knuckle pins. This type is used chiefly for four-wheel trucks. In the second type the steering heads are joined by a rigid member, generally unsprung, the differential and driving gear housing being carried on the frame. In the third class the steering heads (axle ends) are joined only by springs, there being no rigid carrying member. Mr. Chase pointed out that many of the advantages of front-wheel drive given in the following tabulation do not apply to the first class. The possible advantages of front-wheel drive were summarized in the paper as follows:

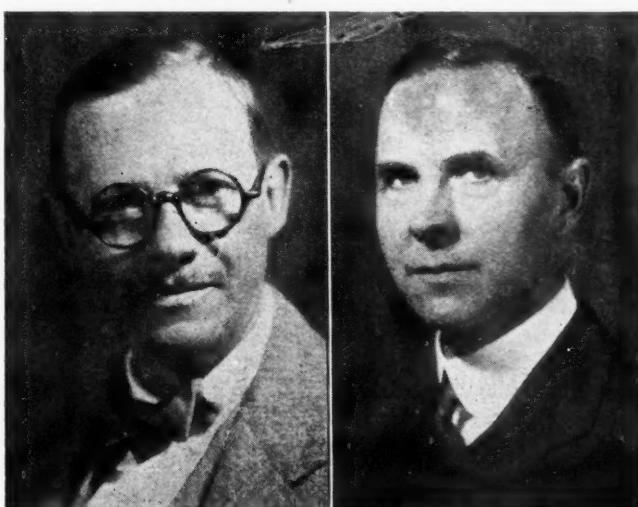
1. Relatively unencumbered space for a body of almost any desired design, floor height and dimensions.
2. Elimination of a bulky and complicated rear axle.
3. Possibility of improved riding-qualities, including a lessened pitching tendency.

4. Increased safety due to less skidding tendency and to ability to take turns at higher speed.
5. Driving force always applied to the wheels in the direction of their motion.
6. Elimination of a long propeller-shaft and substitution of shafts having lower speed and less tendency to vibrate.
7. Possibility of improved traction under certain conditions.
8. Possibility of greater quietness and freedom from body rumble.
9. Ability to provide front-wheel braking without carrying brake-drums and operating mechanism on wheels or axles.
10. Lower upkeep-costs due to greater accessibility and better lubrication.
11. A less expensive rear-axle and a simplified frame-construction.
12. Freedom from shimmy tendencies.
13. A possible decrease in tire wear due to lessened skidding tendency.
14. Decrease in the total weight of the vehicle.
15. Decreased side-sway.
16. Decreased thrust on front-wheel bearings.
17. Front axle and springs can be relieved of all braking torque.
18. All springs can be relieved of driving-torque reaction.

These advantages are offset by the following possible disadvantages:

1. Decreased traction under some conditions, notably in hill climbing and when accelerating.
2. Possibility of greater injury to the driving mechanism in the event of collision.
3. Difficulty of obtaining satisfactory weight-distribution, especially in trucks and motorcoaches.
4. Increased over-all length, or an increased wheel-base for the same length of body.
5. Increased complication in the driving mechanism.
6. Decreased space for the radiator.
7. Increased expenses of the front axle, or its equivalent, and the driving mechanism.
8. Insufficient road clearance in front, considering the present small-diameter wheels.
9. Difficulty of getting a quiet drive, especially with a bevel drive mounted on the frame.
10. Possible slight decrease in mechanical efficiency.
11. Harder steering, due to increased load on the front axle and the steering pivots.
12. Difficulty of obtaining an adequate steering-angle.

"Nearly all engineers experienced with front-drive cars comment upon the increased safety, due to the decreased tendency to skid on turns," Mr. Chase said.



Herbert Chase (left) of the Erickson Co., read a paper on front wheel drives at the Transmission Session. W. T. Fishleigh was chairman

"This has led to the extensive use of such drives on racing cars. Very likely this is due in part to the fact that the driving force is applied always in the direction in which the front wheels are headed, while with rear drive this force always is parallel to the axis of the car and therefore is at an angle to the planes of the front wheels when they are cramped. At such times there is a component parallel to the axis of the front wheels that tends to cause them to skid. This component increases rapidly as the turning angle increases.

"The decreased tendency of front-drive vehicles to skid, and the fact that the driving force turns as the wheel is cramped in steering, make it possible to negotiate curves at higher speeds and thus to add to the safety of driving. To the extent that a front drive lowers the center of gravity of a vehicle it adds again to the safety factor. This is an indirect result due to the lower body-platform rather than to the front drive itself."

Mr. Chase pointed out that brakes on front wheels have at least three disadvantages that can be overcome easily on a car having front-wheel drive: (1) They add to the unsprung weight on the wheel; (2) they require an actuating mechanism that is not

affected by cramping the wheels or by the displacement of the axle when spring action takes place, and (3) they impose braking stresses on axle and springs. With front-wheel drive these disadvantages are eliminated by the simple expedient of mounting the brakes on the chassis frame, on both sides of the differential or on the propeller shaft.

Frame mounting of the brakes simplifies connections, permits of the use of lighter axle parts and facilitates complete enclosure. Brakes so mounted are also more readily cooled than transmission brakes on cars with rear-end drive.

In the discussion of Mr. Chase's paper, President Wall said the use of front-wheel drive would materially reduce the unsprung weight at the rear, with very beneficial effects on the riding qualities. He had had a good deal of experience with front-wheel drive in trucks during the war and they invariably gave better results than rear-wheel drive. Another advantage of front drive was that with it the engine was located farther back of the radiator and this gave the radiator a better chance to perform its function.

Lee Oldfield referred to the reduction in the weight on the driving wheels with front-wheel drive due to the driving torque, and said that in the 500-mile race at Indianapolis there was undoubtedly a great deal of wheel spin with the front-wheel drive cars, and this also accounted for much of the trouble with super-charger drives.

Joseph Anglada said he had been associated with Walter Christie when the latter built his front drive racing car as well as a front drive taxicab. The racing car gave a very good account of itself and the taxicab weighed from 10 to 15 per cent less than comparable cabs with rear drive.



Dalton Risley, Jr., general manager, Craver-oiler Co., as chairman of the Golf Committee made the golf tournament enjoyable in spite of unfavorable conditions

Some of the sports activities at the convention are pictured below. The center picture may seem out of place, but it's really all right—just a group of the delegates getting ready for the 19th hole

Winner of the
golf tournament
—J. B. Shea, in
charge of manu-
facturers' sales
department, Fire-
stone Tire & Rub-
ber Co.



Engine Session Paper Describes New Electrical Indicator

Process of rational analysis and experimental verification by which dual valve spring design was evolved also detailed.

By P. M. Heldt

THREE papers were read practically in full at the Engine Session, at which W. R. Strickland presided. Of these, the first, "A New Electrical Engine Indicator," required nearly two hours for its presentation, and the second, on "Poppet Valve Spring Design," nearly an hour, leaving little time for the third paper and no time for discussion. A fourth paper scheduled for this session, on "Crankshaft Distortion Research," by Prof. C. A. Norman of Ohio State University, was read by title only.

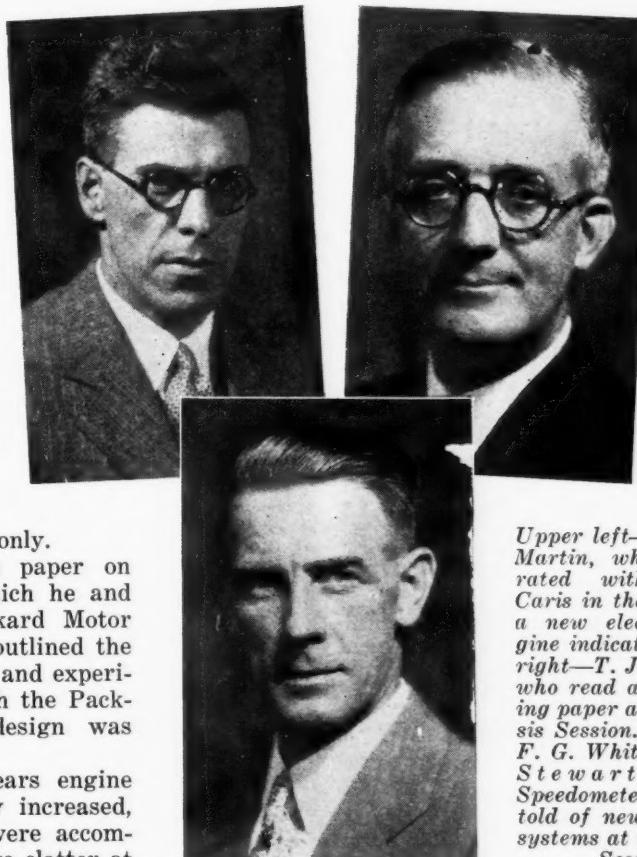
W. R. Griswold in the paper on valve spring design, of which he and A. Morehouse of the Packard Motor Car Co. were the authors, outlined the process of rational analysis and experimental verification by which the Packard dual valve spring design was evolved.

During the past few years engine speeds have been generally increased, and such increases often were accompanied by trouble from valve clatter at some speed below the maximum at which it was desired to run the engine.

The valve gear would suffer considerable injury from extended runs at this speed. For instance, the key grooves at the bottom of the valve stem would wear badly, or excessive wear would occur at the valve seats in the cylinder blocks, or at the valve stem guides; the exhaust valves would pit or burn and sometimes there would be a peening action between the cam and cam follower, and in all cases the proportion of valve breakages would be rather high.

The natural impulse is to use stronger valve springs, made of heavier gage wire. This would raise the troublesome speed but would not entirely eliminate troubles.

It has been shown by Wohler, Unwin and others that where a part is subjected to cyclic stresses between definite limits, the maximum safe stress depends upon the stress range, and Unwin developed a formula giving the maximum safe stress in terms of the ultimate strength and the stress range. The equation is not directly applicable to coiled springs, however, as these



Upper left—Dr. E. J. Martin, who collaborated with D. F. Caris in the paper on a new electrical engine indicator. Upper right—T. J. Little, Jr., who read an interesting paper at the Chassis Session. Bottom—F. G. Whittington, of Stewart-Warner Speedometer Corp., told of new fuel feed systems at the Engine Session

are subjected chiefly to torsional instead of tensile stress. However, springs for a series of life tests were designed from an adaptation of this formula.

Another theory investigated was that the cam action induced in the parts acted upon periodic or harmonic motions of frequencies much higher than the speed of revolution of the camshaft. Any periodic motion may be considered as a complex harmonic motion which can be resolved into

a series of simple harmonic motions of increasing frequencies. The authors applied this analysis to a particular valve motion, resolving it into 12 harmonics. In a general way the amplitude of the motion decreased with the order of the harmonic, but some of the harmonies (the sixth

and tenth) had a practically negligible amplitude. Whenever the speed of the camshaft, multiplied by the order number of the harmonic, is equal to the natural frequency of the spring there should be resonance and therefore singing. The results of tests did not fully bear out this theory.

From their analysis and experimentation, Messrs. Morehouse and Griswold drew the following conclusions regarding the design of springs for the valves of high-speed engines:

1. The ratio of the "rate" of the spring to its weight must be high.
2. Valve breakage is attributable to high excess stresses superimposed upon the static stresses.
3. The static stress range and maximum stress must be within safe limits.
4. The non-harmonic waves in the spring may excite harmonic vibrations in it.
5. The shape of the valve lift curve has an influ-

ence on spring vibration.

6. High valve lift adds to the difficulty of spring design because it involves high valve velocity and high stress range.

In the first part of their paper on "A New Electrical Engine Indicator," E. J. Martin and D. F. Caris, of the General Motors Corp. Research Laboratories, listed the requirements which a good indicator for internal combustion engines must meet and then they

briefly discussed the different types of indicator that have been built and used for this purpose in the past, including mechanical, optical, sampling-valve and electrical indicators.

Stated briefly, the new engine indicator is a device in which the engine pressure varies the resistance of the two carbon pile rheostats. This resistance variation produces in a Wheatstone-bridge circuit an unbalance that is proportional to the pressure and is recorded by an oscillograph. In 1927 Peters produced a greatly superior carbon pile, with plates made of very hard carbon, and this new carbon pile is used in the indicator.

Fig. 1 is a drawing of the new indicator with a diagram of the necessary electrical circuit. The frame is of oil-hardening tool-steel, machined so that one end is threaded to screw into the combustion-chamber wall. In cutting out the interior of the frame, a tongue *C* is left projecting from one side and extending nearly to the opposite side. The dimensions of the tongue are such that, when loaded with the push-rod *D* and carbon piles *R*₁ and *R*₂, its natural period is sufficiently high for the research for which it may be intended. The frequencies of the tongues so far constructed range between 3500 and 500 cycles per sec. The tongue acts as a cantilever spring, the very small deflection of which is a means of measuring the pressure upon the diaphragm *E*. After machining, the frame is heat-treated and then ground to final dimensions. The carbon piles *R*₁ and *R*₂ are held between the tongue and the ends of the frame by pressure on the plates *F*, which is controlled by the adjusting screws *G*. The rounded points of the screws fit into recesses in the plates.

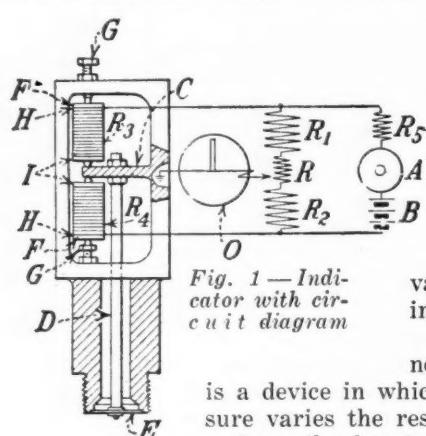


Fig. 1—Indicator with circuit diagram

At the adjusting screw ends of the carbon piles are copper plates *H*, to which wires are soldered for electrical connections to the Wheatstone bridge. Three wires are the only connections between the recording apparatus and the indicator proper, and they can be incorporated in a three-wire cable 20 to 50 ft. in length. Because of this feature, the recording apparatus need not be subjected to engine vibration.

The connecting link between the diaphragm and the tongue is the hollow rod *D*, made of invar steel to avoid temperature effects. In practice, the rod becomes heated at one end only, being cooled by a stream of air directed against the diaphragm.

Steel Disk Diaphragm

The diaphragm *E* is a thin steel disk brazed to the threaded end of the frame and connected at its center to the push-rod. The elastic constants of the diaphragm have no influence upon the records obtained. So great is the sensitivity of the carbon piles, combined with the recording apparatus and the design of the tongue, that so far no work has been done in which the deflection of the diaphragm equaled 0.0005 in. Operation of this instrument does not depend upon an elastic diaphragm, because the displacements are so small that the restoring forces set up in the diaphragm are negligible compared with those set up in the tongue, which is located where it remains cool.

In calibrating the instrument compressed air or nitrogen is valved into a reducing chamber and the pressure is adjusted by means of a needle valve and measured with a test gage. The oscillograph deflection is measured for various pressures throughout the range occurring in the engine. The resulting deflections, plotted against the corresponding pressures, give a calibration curve.

Two diagrams obtained with the indicator are reproduced herewith. They are contact prints from films made with a General Electric Oscillograph in the General Motors Laboratory. Fig. 2 shows a compression diagram, the engine being driven by a dynamometer. This card could have been made longer to advantage, by driving the film drum faster. Fig. 3 shows a diagram of smooth outline even though considerable detonation was present when it was taken on the same film without causing confusion. On the 12-in. film ordinarily used with the oscillograph, 25 or more complete diagrams can be recorded, while with a large film holder built in the G. M. Laboratory, 100 or more diagrams can be recorded on one film.

In connection with the new indicator use has been made also of a portable low-voltage cathode ray os-

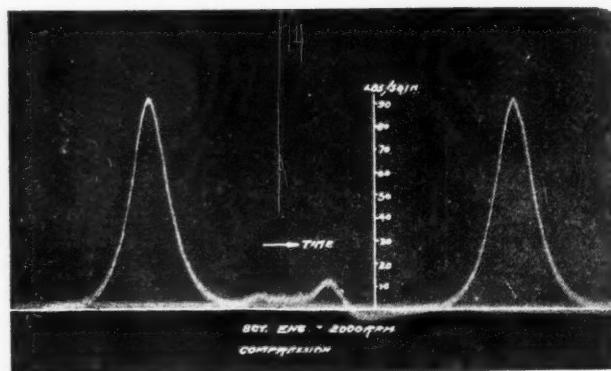


Fig. 2—Compression pressure diagram taken while engine was being turned over by dynamometer

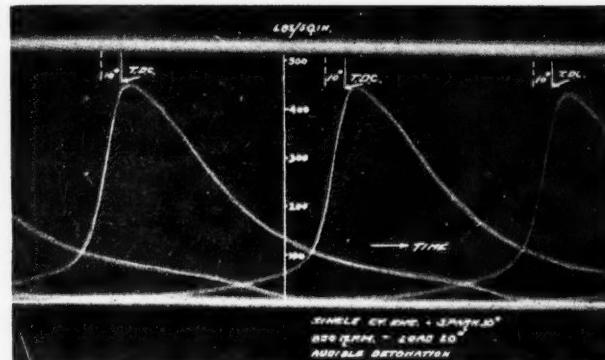


Fig. 3—Successive cycles taken from single-cylinder engine when there was audible detonation

cillograph described by J. B. Johnson in the Journal of the Optical Society of America for Sept. 1922. This oscillograph is said to be as simple to operate as an ordinary radio amplifier tube.

The most obvious shortcoming of the indicator in its present stage of development is that no means are provided for taking pressure-volume cards. For fundamental research, the pressure-time cards are probably much to be preferred; but for routine work, pressure-volume cards also are desirable without the trouble of re-plotting. If the demand for pressure-volume cards becomes great enough, some provision may be made for giving the cathode-ray spot a reciprocating motion controlled by the engine. In the case of the mechanical oscillograph, the beam of light from the element will have to be reflected from a second mirror having a reciprocating motion controlled by the engine. In both cases an attempt will be made to attain the result electrically in such a way that electrical conductors will constitute the only connections to the engine.

At present the new indicator cannot be connected to an engine without drilling and tapping a special hole in the cylinder head, but the design of a unit to serve both as a spark-plug and an indicator is nearly complete.

Crankshaft Distortion

The paper on "Angular Distortion of Crankshafts," was presented by Professors C. A. Norman and K. W. Stinson of Ohio State University. They had been furnished with a complete six-cylinder engine with four-bearing crankshaft, and with four additional crankshafts, by the Continental Motors Corp., on which the tests had been made. In the extra crankshafts the long crank arms had been planed down so that the cross sections of the arms in the various crankshafts constituted a series varying from $3\frac{1}{8}$ by $1\frac{1}{8}$ in. to $2\frac{1}{2}$ by 1 in. The shafts were fitted one after another into the inverted engine block, the crankcase and block being fastened rigidly into a welded frame. While one end of the crankshaft was anchored, a measured torque was applied to the other end. Various points along each crankshaft, at the roots of the fillets of the various arms and spaces, 0.05-0.06 in. away from the adjoining arms, were marked by light punch marks 180 deg. apart. In these punch marks were clamped the points of carriers for mirrors which reflected beams of light by means of which and a scale and telescope the various deflections were measured.

Deflections of cylindrical parts subjected to plain torsion follow a simple law and are very readily determined, and the object of the tests was to determine the angular deflection due to crank arms. It was found this could be expressed by:



A distinguished visitor at the convention was Maj. E. G. E. Beaumont, president of the Institute of Automobile Engineers (England)

$$1000 f = 0.125 + 0.51/I$$

where f is the deflection in radians for 4000 lb.-in. of torque and I is the moment of inertia of the arm section.

If the torsional deflection were due merely to the bending of the arm regarded as a cantilever, it should



The Body Session was in charge of H. Lyard Towle (left). Paul Thomas, sales promotion manager, Cheney Brothers Co., spoke on design features that appeal to women

be inversely proportional to the moment of inertia. An investigation showed that the values of the term $0.51/I$ correspond very closely with those obtained from the fundamental equation for the angular deflection of cantilever beams, from which the conclusion was drawn that the constant value, 0.125 was due to some other cause, probably distortion of the root of the arms, since the adjoining crank arms and crankpins were all alike. This supposition was verified by experiment. An intermediate piece was bolted to the flywheel flange, this piece having a throat which originally had a diameter of $2\frac{3}{8}$ in. and was turned down successively to 2, $1\frac{3}{4}$ and $1\frac{1}{2}$ in. Deflection measurements for the throat were made by means of the mirrors and it was found that the deflections could be expressed by the equation

$$1000 f = 1.44/d^3$$

If the root distortion were simple torsion, the deflection should be inversely proportional to the fourth power of the pin diameter. That it is inversely proportional to the third power is explained by stating that the pin may be regarded as extending some distance into the arm, this distance being proportional to the pin diameter, and since torsional deflection is inversely proportional to the fourth power of the diameter and directly to the length, and the additional length is proportional to the diameter, the distortion should be inversely proportional to the third power of the diameter, as it was found to be.

The authors finally arrive at the following equation for the angular deflection of a crankshaft due to one radial arm—

$$f = T (5 d^4 G + 0.51 L^2/r E I),$$

where f is the angular deflection in radians; T , the torque on the crankshaft in lb.-in.; d , the diameter of the crank journal or pin; G , the modulus of elasticity in shear; L , the length of the arm; r , the crank radius; E , the modulus of elasticity of the material and I the moment of inertia of the section of the arm.

S. A. E. Holds a Country Fair



THE Country Fair held on the opening evening of the convention was an outstanding social success. With Dalton Risley, Jr., as ballyhoo man, the Pennsylvania section (1) had an old-fashioned bar that kept the patrons coming back for more. Chicago (2) gave ring-throwing artists a chance to try their skill. Three little maids from school were there (3). The Indianapolis section staged an indoor automobile race (4). Fay Chandler (5) was chairman of the committee in charge of the affair. Milwaukee showed a wonderful new engine (6), while New England had a peep show (7).

Results of Fuel Investigations Told at Research Session

Papers read by Donald B. Brooks and Dr. O. C. Bridgeman of the Bureau of Standards with written discussion by Frank Mock.

TWO papers on fuel research at the Bureau of Standards were presented at the Research Session. The first, by Donald B. Brooks, research associate of the bureau's automotive laboratory, dealt with "The Influence of Fuel Characteristics on Engine Acceleration." The second, on "Dew Point Data on Gasoline," was presented by Oscar C. Bridgeman, research associate of the bureau. Dr. H. C. Dickinson of the bureau presided during the first part, and H. M. Crane, vice-president, General Motors Corp., during the second.

The discussion was confined to the reading of a written discussion prepared by Frank C. Mock, Stromberg Motor Devices Co., and read by H. K. Cummings, of the Bureau of Standards. As Mr. Crane later emphasized, this discussion showed that no conceivable changes in fuel will solve some of our research problems, and that these are largely a question of engine design. Mr. Crane also stated that there was a need for some method of specification for detonation qualities of a fuel.

Tells of Investigation

Mr. Brooks told of an investigation made to determine the influence of fuel characteristics on engine acceleration. This formed part of the research work carried out by the bureau for the Committee on the Utilization of Present Fuels in Present Engines. This investigation called for a method of measuring engine acceleration accurately. Several methods were suggested and the method adopted consisted in driving a paper tape at a speed proportional to the engine speed, and discharging a spark through the tape at equal time intervals. This gives a displacement-time record, the second derivative of which is the acceleration. One reason for selecting this method is that the absolute measurements involved can be made with great accuracy.

Tests were made on three specially prepared fuels to study the effect of the A.S.T.M. 50 per cent point on acceleration. The conclusions drawn from two series of tests of three fuels all having the same 20 per cent point (221 deg. Fahr.) the same 90 deg. point 392 deg. Fahr., and 50 per cent points of 248, 284 and 326 deg. Fahr. respectively, are (1) that under conditions giving less than 50 per cent vaporization in the manifold, there is little effect of differences in the A.S.T.M. 50 per cent point with fuels having like 20 per cent points, and (2) that under conditions giving slightly more than 50 per cent vaporization in the manifold, the primary influence of the A.S.T.M. 50 per cent point is shown chiefly in the initial lag, although some variations in acceleration are indicated. It should be noted that the vaporization during acceleration may depart widely from equilibrium condi-

tions, and equilibrium air-distillation data are not therefore directly applicable.

Dr. Bridgeman, in his paper on "Dew Point Data on Gasoline," pointed out that in previous reports to the Society by the same author on the fuel volatility work

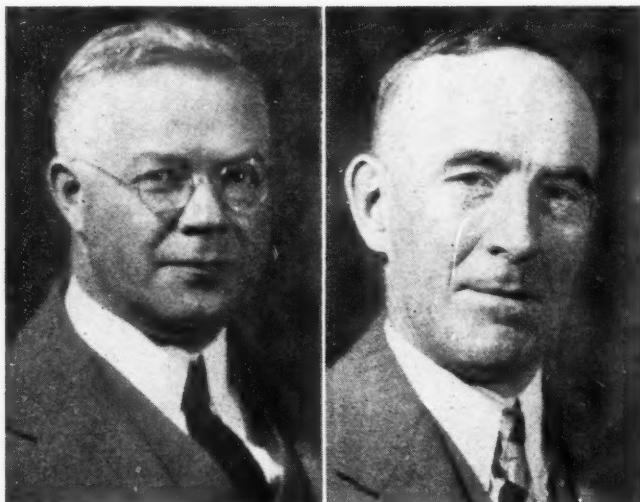


Donald B. Brooks (left) and Dr. O. C. Bridgeman, research associates at the Bureau of Standards, who spoke at the Research Session

being conducted at the Bureau of Standards in cooperation with the automotive and petroleum industries, an apparatus and method was described for the determination of volatility and a correlation over the range from 10 per cent to 90 per cent was pointed out between data obtained by this method and the A. S. T. M. distillation curves of the fuels. The present paper covers an extension of the range to 100 per cent evaporated which constitutes the dew point line.

21 Gasolines Tested

With the Sligh equilibrium air distillation apparatus dew point data for 21 diverse gasolines were obtained covering mixtures of air and fuel from 8-1 to 20-1 by extrapolation of the A.E.D. curve to 100 per cent evaporated. For each mixture, the dew point temperatures were found to be related to the 90 per cent A.S.T.M. distillation points of the fuels by means of a simple ratio of absolute temperatures independent of the particular gasoline employed. Similar results for mixtures from 1-1 to 16-1 were obtained with a modified Stevenson and Babor apparatus on five gasolines, using an illuminated platinum black surface to detect condensation of liquid. With the latter apparatus, values of the normal dew point at 1 atm.



James L. Smith (left) of the Gray Coach Lines, and R. A. C. Henry, director, Bureau of Economics, Canadian National Railways, were speakers at the Transportation Session

pressure in the absence of air were obtained for 15 gasolines, and these were found to be related to the 90 per cent A.S.T.M. point by a simple ratio of the

absolute temperatures. Corroborative evidence was obtained from measurements of the equilibrium solution temperatures of five gasolines. The temperature ratios obtained by these two methods were in good agreement with one another and with ratios computed from the work of seven other sets of observers by four different methods.

Dew Point Readily Determined

An equation was obtained for the ratios between the absolute temperatures of the normal dew points and the dew points of the various air-fuel mixtures in terms of mixture ratio as the independent variable, and values computed from this equation were in good agreement with the work of other investigators. Molecular weight determinations were made on 24 gasolines and an approximate relation to density was deduced. Using the molecular weight values, the temperature ratios were expressed analytically in terms of partial pressures of the fuel in the mixtures. By means of equations deduced from the experimental data, it is shown that the dew point of a mixture at any reduced pressure may be evaluated. The general conclusion reached is that the dew point for any mixture of commercial gasolines and air may be computed accurately from 90 per cent A.S.T.M. distillation point without recourse to additional experimentation.

Predicts Universal Use of *Ground Gears* in Transmissions

Slow progress in this direction in past is fault of designers, says British engineer at Transmission Production Session.

TWO papers were presented at the Transmission Production Session, one on "Ground Gears and Transmission Design" by H. L. F. Orcutt an English engineer; the other on "Simultaneous Inspection and Correction of Gears in Production," by Charles H. Logue and R. B. Fehr. D. D. Ormsby acted as chairman.

A prepared discussion on the Orcutt paper was submitted by P. L. Tenney of the Muncie Products Division of the General Motors Corp., this being of such length as to practically constitute an additional paper.

Mr. Orcutt, who is managing director of the Gear Grinding Co., Ltd., Birmingham, Eng., said universal use of ground gears in transmission is in sight, and that progress in this direction has been so slow in the past is the fault of designers.

Mr. Orcutt objected particularly to the cluster gear, which he said is a hopeless design from the quality standpoint. Even with only two gears in the cluster, one or the other or both will be bad. If they are hardened and the hole is ground by chucking from one gear, the other gear will be out of true. The more gears there are on the cluster, the worse are the results. If the teeth are heat-treated and finished afterward, the cutters wear so rapidly that accuracy is impracticable. The cheapest tooth-grinding is impossible on nearly all cluster gears.

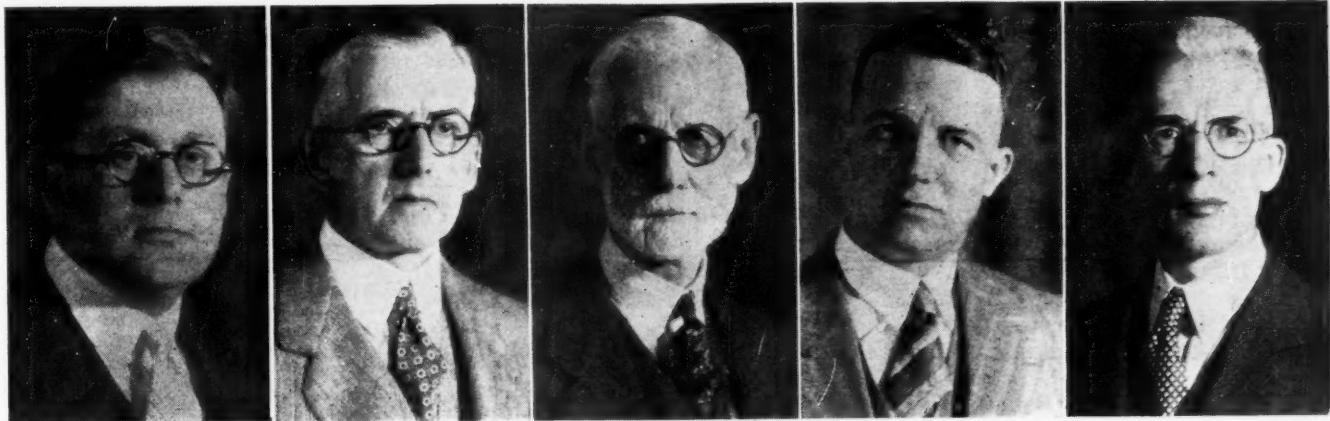
If individual gears are decided upon, results will be better, as they can be treated independently in every process. However, they cannot be of the highest quality if they are finished with a cutter, no matter what routine of production is employed. For the best quality, we must make use of gears in which the teeth are ground as the last operation.

Transmission gears with hardened and ground teeth, running at about 2000 ft. per min., may have a maximum pressure of about 1200 lb. per sq. in. of tooth face, with temporary overloads.

Easier to Finish Accurately

Full-depth teeth are easier to finish accurately and have better running qualities than stub-teeth. The most satisfactory all-around results are attained with a 20-deg. pressure-angle, and the full, accurate and complete involute is the most satisfactory form of tooth. Small numbers of teeth in the constant-mesh, first-speed and reverse pinions are common, and they do not allow good tooth contact. The center distance between the mainshaft and the countershaft must be large enough to permit at least 18 teeth in the smallest pinion. More desirable figures are 20 teeth for small cars and not less than 24 for the larger cars.

There is no difficulty in keeping the variety of gear sizes small. Good ratios are easily found in a four-speed



Identified with the Transmission Production Session were (left to right): P. L. Tenney, Muncie Products Division, General Motors Corp.; Charles H. Logue, Copland Gear Lapping Syndicate; H. L. F. Orcutt, Gear Grinding Co., Ltd.; R. B. Fehr, Copland Gear Lapping Syndicate, and D. D. Ormsby, who presided

transmission with only nine gears, having only four different numbers of teeth. Except for very special cases there is no excuse for a transmission with ten gears, each with a different number of teeth.

The best form of splined shaft for both fixed and sliding gears is one on which the gears are fitted at the bottom of the splines. This surface can be finished with practically as great accuracy as a completely cylindrical surface, and the holes in the gears can be ground with no more difficulty than if they were completely cylindrical.

Shafts can be finished in the grinding machine, allowing very fine clearances for the gears with no hand fitting whatever. Gears can be made to slide freely with not more than 0.0005-in. clearance between the hole and the shaft. Fixed gears can be made with virtually the same clearances as sliding gears, and broaches can be the same for gears on both the main and the countershaft.

The six-splined shaft meets the requirements of cheap assembly, close fits, easy working, good alignment, maximum strength, interchangeability, low cost and complete security. Lubrication is easily maintained, and very little backlash between keys and slots in gears need be specified.

It is not necessary to harden splined transmission shafts as, in a properly proportioned unit, they can easily be made large enough to provide generous sliding surfaces that will not wear.

Third-speed gears of a four-speed transmission are always the most difficult to make quiet under load. Much of this trouble is caused by displacement of the main shaft due to compression of oil-films in the pilot bearing and the constant-mesh-pinion bearings. In many transmissions this amounts to as much as 0.003 in., which is enough to convert quiet third-speed gears into howlers. This defect is aggravated when the main shaft is piloted into an overhung constant-mesh pinion.

Refined operation characteristics will never be secured as long as engineers make light weight the beginning and end of all their work on transmission design. Sufficient metal to secure rigidity for correct tooth contact can be accepted as an indispensable requirement. Undoubtedly the greatest difficulty will be encountered when troubles are other than mechanical inaccuracy and the study of gearbox acoustics begins. Resonance in transmission cases has not been made the subject of special research. Objectionable noises seem both to be created in the case and to be echoed in it from other mechanisms.

Mr. Orcutt presented two designs of four-speed trans-

mission, one for a small, the other for a large and high-grade car. Novel features of the latter transmission are that the splined shaft has no pilot, and engagement for direct drive is made when the clutch teeth in the third-speed sliding gear are pushed through the inner race of the ball bearing and lock with teeth on the constant-mesh pinion shaft. No radial displacement can occur with this design, as all of the sliding gears are supported on a large shaft mounted between two ball bearings.

The gears of this transmission have a special form of teeth giving a long arc of contact. These teeth have an addendum of 0.41 times the circular pitch and a dedendum of 0.46 times the circular pitch, making the working depth equal to 0.82 times the circular pitch, as compared with 0.70 in standard full depth gearing and 0.56 for the stub teeth commonly used in transmissions. With these tooth proportions and the numbers of teeth used the full tooth load is at no time taken by a single pair of teeth. These long addendum teeth, according to Mr. Orcutt, are of practical value when the gears are accurately finished, but not otherwise.

MR. TENNEY said that he agreed with all of the fundamentals laid down by Mr. Orcutt, but differed from him in the viewpoints. He had seen very few transmissions that were made well enough otherwise to justify grinding of the teeth, and it is only after the other factors affecting gear operations have been properly taken care of that gear grinding really shows its value. Such grinding will better a good transmission but it will not help a poor one.

In a large truck transmission, in order to avoid gear clatter due to backlash, it was necessary to hold the backlash down to limits of + 0.003 and 0.005 in. This proved to be commercially impossible by the usual cutting and case-hardening process and grinding was resorted to. It cured the gear clatter but it did not succeed in changing the gear noise in regular operation.

As to Mr. Orcutt's remark that designers are responsible for the slow progress in transmission design, it must be remembered that they are governed by the commercial situation, which latter also accounts for the light weight of conventional transmissions, which Mr. Orcutt had pointed to as incompatible with quiet operation.

There was some general discussion on the best form for the chamfer of sliding teeth, particularly on the respective merits of straight chamfers and rounded ends with a view to eliminating sealing of the case and upset-

ting of the teeth. Mr. Orcutt said with ground gears it was permissible to use thinner oils and less of it. In reply to a question from M. G. Hovine, he said that the reason for the use of side by side shafts in some instances was that these were more readily accommodated, particularly in heavy truck and bus chassis, but transmissions with one shaft above the other are on the whole more quiet. Prof. Earle Buckingham said he had found that for a given oil the torque loss due to oil churning in automobile transmissions was practically independent of the speed. Also, there was not as much difference between the torque losses with light and heavy oil respectively as had been anticipated. The reason evidently was that lighter oil could get in between the teeth better.

Maj. E. G. E. Beaumont, of the Anglo-American Oil Co., said that in experience with a fleet of 3000 vehicles operated in England he had found that gear noises often could be eliminated if the mechanical connections in the drive were made less rigid, as by substituting fabric disk for metal universal joints. Major Beaumont said some manufacturers of transmissions round the ends of the teeth in all directions in order to prevent chipping.

Gear Lapping Process— *Logue and Fehr*

MESSRS. LOGUE AND FEHR described a lapping process which has been developed by the Copland Gear Lapping Syndicate, Detroit. In this process use is made of a lap and a gear-lapping machine, and an abrasive compound is caused to flow through the lap, which latter is made of chilled cast iron, gray cast iron or type metal.

The lap, shown at the right in Fig. 1, is made by casting in a mold around the steel chill shown in the central view, which is cut approximately to the dimensions of the gear to be corrected, except that it has a 6-in. face. The chill is removed from the casting by hydraulic or mechanical means, and it can be used repeatedly. The lap need not be made very accurate, as it will automatically be trued-up in from 10 to 30 min. during the normal operation of the machine, and will assume the average form of the gears that are put through it.

The gear-correcting machine performs three main functions. First, it provides a reciprocating motion for either spur or helical gears with respect to the lap, which is suitably fixed on the machine, and also for mutual pressure between the faces of the gear teeth and the lap by the application of torque as soon as the gear has entered the lap. Second, the torque provides not only pressure for rapid abrasion but a positive means for correcting errors in spacing, for, as soon as a new gear enters the lap, the highest three spots on the tooth faces will come into contact with the teeth of the lap, since the gear on its arbor is free to find its own center. Wear of the lap will thus be automatically compensated.

The third function is that the machine advances the gear one tooth in the lap at the completion of every cycle, that is, at every top position. This feature automatically assures uniformity of contour and spacing of the teeth within 0.0002 in.

The success of the process does not depend upon a "charged" lap, but rather upon the continuous application of a suitable abrasive-mixture which is circulated

through the lap by a small vertical centrifugal pump located in the base of the machine. The one most commonly used consists of 10 cc. of FFF carborundum to 15 cc. of kerosene.

Fig. 2 shows the essential mechanisms of the machine for spur and helical gears. The crankshaft *a* and con-

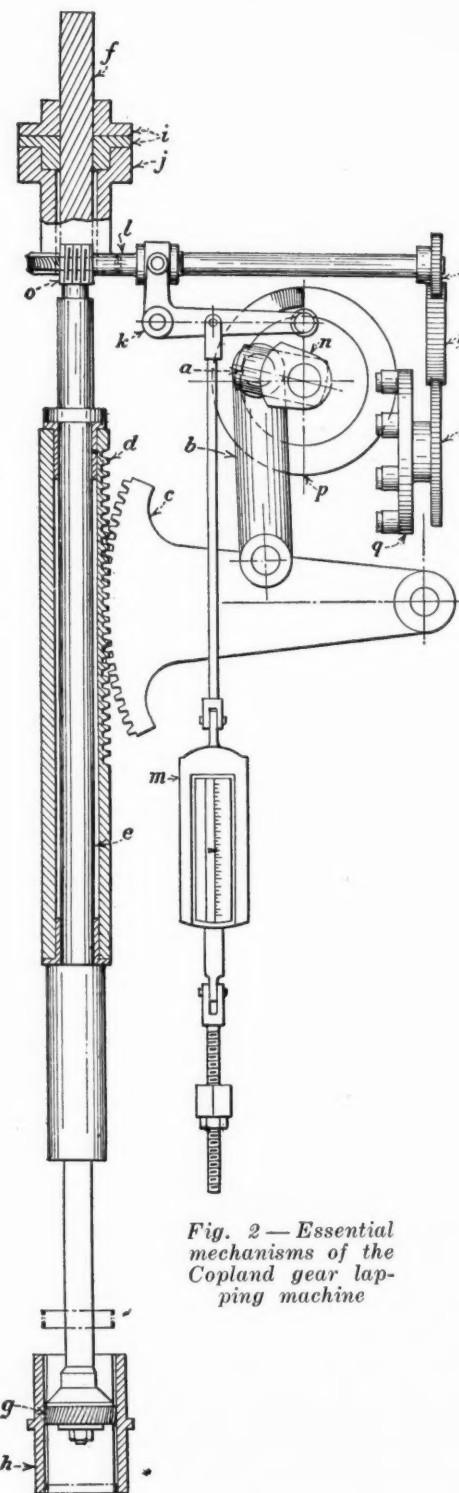


Fig. 2.—Essential mechanisms of the Copland gear lapping machine

nnecting-rod *b* gives reciprocation to the rack segment *c* meshing with rack *d*, which carries the spindle *e* up and down. The helical guide *f* has the same lead as the gear *g* to be corrected and the lap *h*. The helical guide *f* moves through split nut *i*, which is mounted on worm-wheel hub *j*.

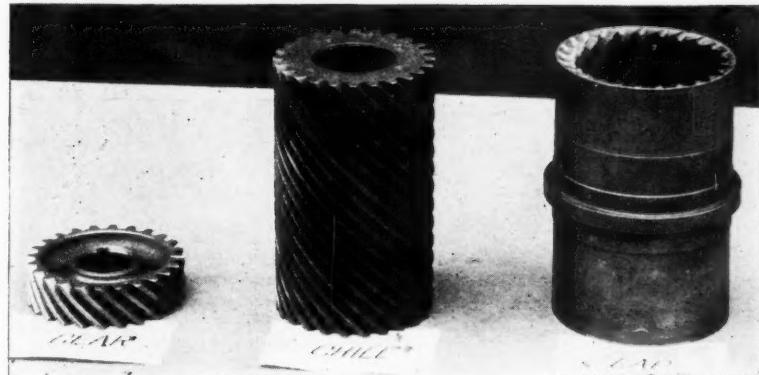


Fig. 1—Gear, chill and lap

Bell-crank lever *k* is connected to worm shaft *l*. Spring scale *m* pulls downward on the arm of lever *k*. Pressure-control cam *n* prevents the arm of lever *k* from falling when gear *g* is leaving the lap to be advanced or "indexed" one tooth and returned to the lap *h*. But as soon as gear *g* has safely entered lap *h*, pressure-control cam *n* moves past the roller at the end of lever *k*, which is then free to move under tension of the spring scale *m*. This moves in an axial direction worm *o*, which, acting as a rack, gives a partial rotation to worm wheel *j* and therefore to gear *g*, until the teeth of gear *g* press against the teeth of lap *h*. The gear *g* goes to the bottom of lap *h* and returns to the top, when pressure-control cam *n* lifts lever *k* and moves the teeth of gear *g* away from the top teeth of lap *h*.

When gear *g* is clear of lap *h*, index cam *p* gives partial rotation to pin-wheel *q*, which gives rotation to index gear-train *r* and indexes gear *g* one tooth. After indexing, gear *g* moves toward and enters lap *h*,

lapped gears.

As soon as the gear enters the lap, torque is applied by a suitable spring and lever mechanism controlled by a cam. This pressure is kept on until the gear has completed a down and an up stroke and returned to the top of the lap, when the pressure is removed as the gear emerges from the lap to be advanced one tooth. This two-stroke cycle is repeated until the required footage of lapping has been run, the machine then being stopped automatically with the gear in the top position, for removal of the arbor from the chuck. A crowned face is obtained by keeping the full pressure on while the gear is partly out of the lap at the top and the bottom, thus giving a higher unit pressure at each end of the teeth. The amount of crowning obtained after 200 ft. of gear correcting (the maximum usually required), as determined by half of the difference in the thickness of the tooth in the middle and at the ends is from 0.0010 and 0.0015 in.

and the cycle is repeated until an automatic mechanism stops the machine with the gear at the top of the stroke ready for the operator to take out the arbor holding gear *g* and put in another arbor. The only work the operator does is that of loading, changing, and unloading arbors.

One of the reasons for the quietness of spiral bevel gears is said to be that their teeth are made with a "crowned face," the driven and driving faces having slightly different curvatures, which results in a full profile bearing only over the central portion of the tooth face, the bearing tapering off toward each end of the face. The Copland lapping machine is so designed as to give a similar "crowned face" on the teeth of

Three Papers at Foreign Session

THREE papers were presented at the Foreign Sessions, A. M. Narraway, assistant director and chief aerial surveys engineer, Topographical Survey of Canada, giving the history of the airplane in Canadian survey work, Maj. E. G. Beaumont delivering a paper prepared by Maurice Platt, of *The Motor*, London, on the "Trend in European Passenger Car Design," and R. S. McLaughlin, president, General Motors of Canada, Ltd., discussing the present automobile situation in Canada. W. J. Davidson presided.

Mr. Narraway, in his paper, "The Airplane in Canadian Exploration," gave many interesting facts and figures to show the important part which this vehicle has played, a work the importance of which is often lost sight of in the great publicity attending trans-Atlantic and other long-distance flights.

The importance of the tax situation as affecting the relatively small number of European quantity production manufacturers of automobiles was once more clearly shown in Mr. Platt's paper. As in the United States, the small quantity European manufacturer has the advantage of being able to accomplish more frequent changes of a more radical nature, and thus continues to hold an important position in the industry.

Mr. McLaughlin's address was of a general nature. Among the points brought out, directly affecting the engineering and sales end of the automobile industry,

were the annual sale of 160,000 vehicles, and better success in keeping roads open in winter. The snow problem, according to Mr. McLaughlin, has been quite serious until fairly recently, and owners would not operate cars.

Below — A.
M. Narra-
way

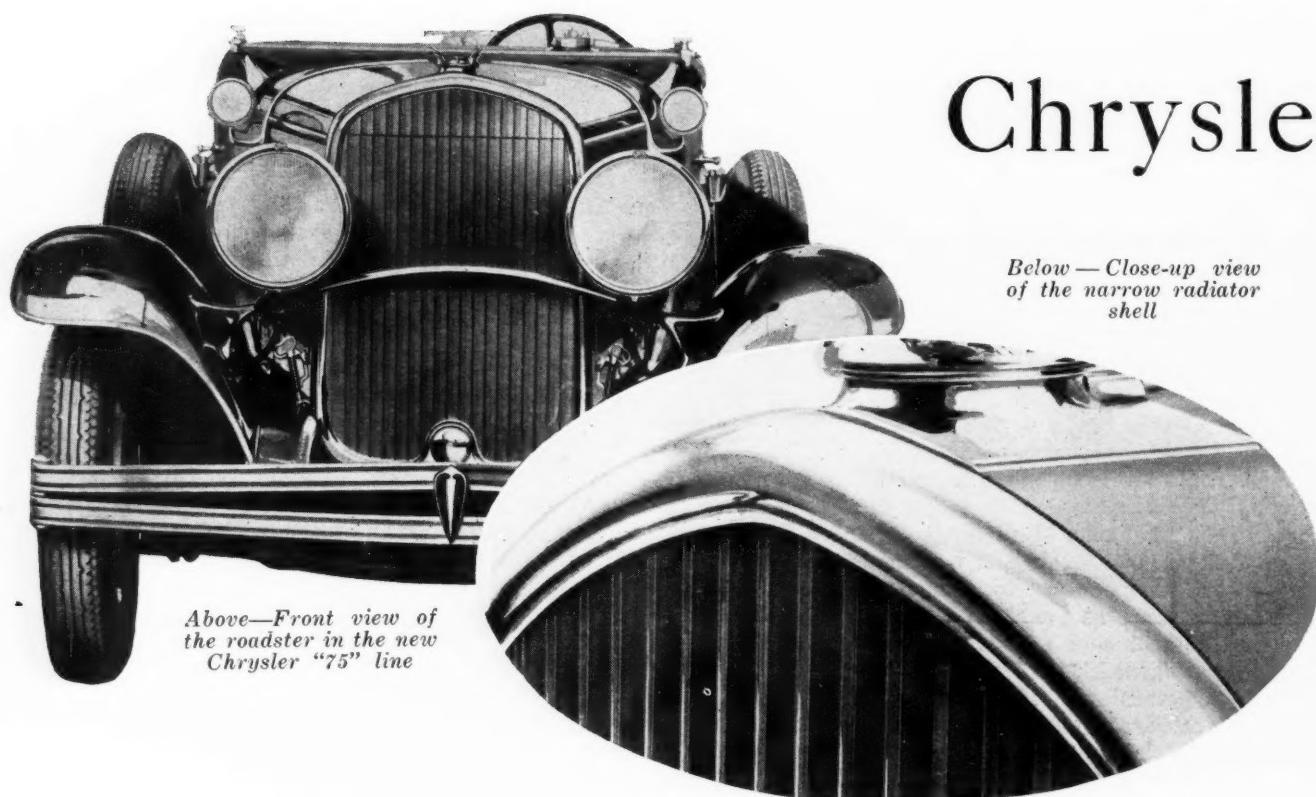


Below — W.
J. Davidson



Above — H.
A. Brown,
vice - presi-
dent, Gen-
eral Motors
of Canada





Above—Front view of the roadster in the new Chrysler "75" line

Below—Close-up view of the narrow radiator shell

Four-cylinder car to be marketed under new name while 62 and 72 series are now designated as "65" and "75."
Power increased and bodies are made longer.

By A. F. Denham

THE Chrysler line for 1929 will include the Plymouth (a development of the Chrysler (52), the 65, which supersedes the 62, and the 75, which supersedes the 72. No changes have been announced in connection with the 80. Nineteen body models are included in the three lines which now appear in new form, as follows:

"75"	
Coupe (with rumble seat)	\$1,535
Roadster (with rumble seat)	1,555
Royal sedan	1,535
Town sedan	1,655
Convertible coupe (with rumble seat)	
Convertible sedan	
Chassis (with cowl)	1,045
Phaeton (five-passenger)	
"65"	
Business coupe	\$1,040
Roadster (with rumble seat)	1,065
Touring	1,075
Two-door sedan	1,065
Coupe (with rumble seat)	1,145
Four-door sedan	1,145
Chassis (with cowl)	825
"Plymouth"	
Roadster (with rumble seat)	\$670
Coupe	670
Two-door sedan	690
Touring	695
De luxe coupe (with rumble seat)	720
Four-door sedan	725
Chassis (with cowl)	490

Changes have been made in the appearance of the cars. All three models have longer bodies, the in-

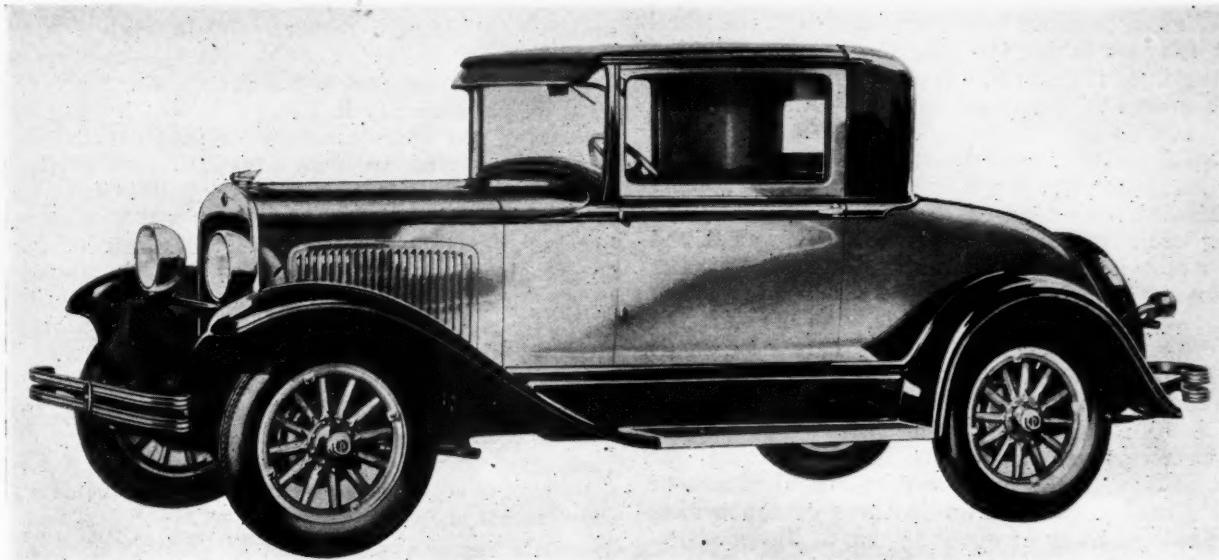
crease in length being confined to the hood. This increase in length from the dash forward, accentuated by narrowing of the radiator shells, and higher radiator, cowl and hood, conveys an impression of more power and speed and greater roominess.

Changes of various external parts contribute further to the general effect. Headlamps are larger, semi-spherical in shape, and chrome-plated (the same as all other external bright parts). They are placed somewhat higher and closer together than formerly and are connected by an arched tie-rod of unconventional design.

Fenders are of the full crowned type. Front fenders have a longer sweep, and the rear aprons are joined to a metal stamping covering the gas tank and frame horns to give the rear of the car a neater appearance. Roofs of closed cars are arched more than formerly. This results in bringing the roof sides down to a lower line, giving the illusion of decreased height, while maintaining the same headroom. Another feature of the new lines is in the use of arched windows on all closed models.

Careful attention has been given to features affecting the comfort of passengers. In order to eliminate drafts, the doors are provided with unusually wide windlasses and those in the closed models are fitted with rubber wiper strips along the bottom edge. Around the pedals and controls have been placed draft plates designed to match with and overlap the floor mat. The latter is of ribbed rubber and has a composition fabric of wood fiber attached to its lower

Introduces Plymouth, Other Models Changed



The four-cylinder, Chrysler-built Plymouth coupe

side to insulate the front compartment with respect to both heat and noise. A waterproof heat and noise insulating liner, composed of fiber-backed heavy cardboard, is placed on the inside of the dash.

Shims of molded live rubber are inserted between the frame and the body sills, at the points where the body bolts are located. Frames on all cars have been reinforced under the bodies. On the Plymouth this is done by the addition of a cross-member of the gusseted channel type back of the transmission. On the six-cylinder models the flange of the side rail is turned down, up to a point near the dash.

Internal Hydraulic Brakes

Mechanical changes are not as important as those in the bodies. They include the adoption of four wheel internal hydraulic brakes instead of the external type, an increase in bore of $\frac{1}{8}$ in. on the "65," and the adoption of a rubber engine mounting of novel design on the Plymouth.

Taking the cars individually, the Plymouth has been improved chiefly with respect to smoothness of operation, a three-point rubber cushioned engine mounting being now used. The front support is of the compression type, a molded cylindrical rubber block being vulcanized to two plates attached to the motor mounting bracket and the frame cross-member respectively. The rear mounting comprises three stamped metal plates, two forming a box in which the rubber is located, and the third floating between the rubber cushions. The rubber itself is vulcanized to all three plates. Since the plates are mounted vertically, the rubber is under tension rather than in compression. The center plate is fastened to the engine bracket.

The method in which this type of mounting functions to reduce the transmission of vibration is somewhat as follows: In a four-cylinder engine the principal vibration is in a vertical plane. The new type of mounting allows the engine considerable freedom in a vertical direction, hence these vibrations are not transmitted to the frame to the same extent as with a rigid mounting.

The method of securing the rubber to the metal plates by vulcanizing has been developed at the Chrysler plant to such a degree that the shearing stress necessary to separate the plate from the rubber is in the neighborhood of 600 lb. per sq. in., experiments having shown that the adhesion actually increases with heat, an important point in view of the possible influence of engine heat on the mountings.

Supplementing these mountings, a torque reaction neutralizer connects the cylinder head at the rear to a spring loaded friction disk mounted on the dash of the car. The friction of this disk absorbs the vibration similarly to a torsion neutralizer on a crankshaft.

In the Plymouth engine, power has been increased by reducing the throttling action through the adoption of $\frac{1}{8}$ in. larger inlet valves, these now being $1\frac{9}{16}$ in. It is claimed that this change together with the redesigned manifolding and carburetor have resulted in an increase in horsepower of 18 per cent. The rear axle reduction has been decreased, thus giving the car a higher road speed at the same engine speed.

In the tappet guide brackets oil reservoirs are formed from which the collected lubricant is led by drilled passages to the tappets themselves. Pressure lubrication has been extended to the center camshaft

bearing, and the cams have been given a quieting contour to reduce tappet noise. A crankcase ventilator in the form of a vertical pipe at the rear, just forward of the flywheel housing, extending into the airstream below the engine pan has been provided. Fresh air enters the crankcase at the front end through the oil filler hole, which may be shut off in the summer, when condensation of water in the crankcase does not occur as readily.

Larger Transmission Gears

Transmission shaft centers are further apart, permitting the use of larger gears. In the rear axle, double Timken bearings have been adopted at the wheel ends, these also taking the axle shaft thrust. Pinion mounting is of the straddle type, using Timken taper roller bearings with shim adjustment. An interesting feature of this axle is in the special shaping of the differential housing cover to assist in the lubrication of the gears through properly directing or deflecting the lubricant.

After considerable experimentation it was found that for most effective braking on this and the other new Chrysler models, a slight excess of braking action on the front wheels was desirable. As a result the brake cylinders at the front wheels have been made $\frac{1}{8}$ in. larger in diameter than those at the rear. The brakes themselves are of the two-shoe Lockheed type, in the case of the Plymouth the shoes being of one-piece construction. Provision for adjustment for concentricity with the drum is provided by means of eccentric anchor pins. Two features of the brakes are the cutting away of about $2\frac{1}{2}$ in. of lining at the top of the rear shoe, where chatter generally is produced due to drum distortion, and the use of molded composition lining. These linings are ground after assembly on the brake shoes, and for servicing the cars complete shoe and lining assemblies, already ground, are offered.

Dimensions of the Plymouth brakes are, diameter 11 in., width $1\frac{1}{2}$ in. A new type of self-compensating master cylinder is also found in this system. It is not of the submerged type, but is fed by gravity. The fluid enters a reservoir back of the plunger. As the plunger returns and creates a partial vacuum in the compression chamber the lip of the rubber cup on the piston is sucked in and some of this fluid is sucked into the compression chamber. As the fluid returns from the brake cylinders, the surplus is pushed out through a small port back to the feed line from the tank on the dash. This port is uncovered only when the plunger is in the full return position.

Front Axle Ends Stronger

The front axle ends have been strengthened and the lower king pin bushings increased in length $\frac{3}{8}$ in. to $1\frac{15}{32}$ in. Metal shackles, adjustable by means of a spring-loaded center bolt take-up, have been adopted for the rear mountings on the Plymouth springs, the springs also being equipped with rebound leaves. Length of the frame has been increased 3 in., 2 in. of which is reflected in increased overall car length. Bumper brackets are integral with the spring horns.

Increased power has also been provided in the engine of the "65." In addition to the $\frac{1}{8}$ in. larger bore which raises this dimension to $3\frac{1}{8}$ in., and gives the engine a displacement of 195.6 cu. in., a taxable rating of 23.43 hp., and an actual peak of 65 hp. at 3200 r.p.m., 17 per cent higher than formerly, the compression ratio has also been increased. With

the standard "Silver Dome" head this is now 5.2 to 1 as against 5.0 to 1 in the 62. The optional higher compression "Redhead" has also been raised 0.2 to a ratio of 6.2 to one, thus maintaining the power differential of 10-12 per cent between the two types of heads.

The seven-bearing crankshaft has been increased in diameter $\frac{1}{8}$ in., all main bearings now being 2 in. in diameter with the same effective bearing lengths. Four counterweights have been added to the crankshaft. Two of these counterweights are directly opposite the crank throws adjacent to the center main bearing and two are located between throws 1 and 2, and 5 and 6 respectively, in such a manner as to counterweight the resultant force of both throws. The changes in the crankshaft increase its total weight about 10 lb.

Some of the new developments incorporated in the Plymouth engine are also found in that of the 65. These include $1\frac{7}{16}$ in. diameter inlet valves, quieting cam contours, and oil pockets in the valve guide brackets for tappet lubrication. Piston pins in the 65 are also larger in diameter as well as longer due to the increased bore. Diameter and length are now $1\frac{3}{16}$ in. and $2\frac{13}{16}$ in. respectively. Two "tungtite" rings of the same design as those introduced last summer on the 72 and 80 models are now fitted to each 65 piston. These rings are used in pairs, oil being trapped between the piston and the tongues on the rings. This, it is claimed, provides better heat transfer from the piston to the cylinder walls. A $\frac{1}{8}$ in. oil control ring supplements the compression rings.

Fan Belt Drives Generator

The front-end drive chain has been shortened up considerably by using the fan belt to drive the generator. Adjustment of the fan belt is by swinging the generator. Changes have also been made in both inlet and exhaust manifolds. In the latter the outlet is now at the front end. A new type of Stromberg carburetor is used, incorporating an adjustment for idling speed only, fixed jets being provided for running conditions, which are calibrated to take care of all differences in temperature or altitude encountered.

On the chassis of the 65 also there are incorporated some of the new features embodied in the Plymouth. These include the same type of internal hydraulic Lockheed four-wheel brakes, although they are larger in size, the drums having an inside diameter of 14 in., and using $1\frac{3}{4}$ in. width molded composition lining. Front axle king pin bushings on this model have been increased in size, inside diameter now being $\frac{7}{8}$ in. or $\frac{1}{8}$ in. larger, and lengths for top and bottom $1\frac{1}{4}$ and $1\frac{1}{2}$ in. respectively as against $1\frac{3}{32}$ in. for both formerly.

Similar in design to the corresponding unit in the Plymouth, the rear axle of the 65 uses double Timken taper roller bearings at the wheel hub. Gear ratios differ for the various body models and according to whether or not the "Redhead" is used, these ranging from 4.3 to 4.9 to one. One of the recently standardized tire sizes with dimension of 5.50 x 18 in. has been adopted instead of the former 28 x 5.25 size.

Lovejoy hydraulic shock absorbers have been made standard equipment. The frame has been lengthened $9\frac{5}{8}$ in. to $184\frac{3}{8}$ in., and the bodies $5\frac{1}{2}$ in. to $173\frac{1}{4}$ in. and has been strengthened in the same manner as that of the 75.

Among the new features of the "75" chassis are increased length, new brakes, redesigned rear axles,

radiator shutters, Lovejoy shock absorbers, more rigid frame and the adoption of a new steel for the exhaust valves.

Actual increase in frame length is $2\frac{3}{4}$ in., the new length being $172\frac{3}{4}$ in., with bodies increased $3\frac{1}{2}$ in. to $185\frac{1}{2}$ in. overall. The lower flange of the side member has been turned down from the rear to a point near the dash to provide greater torsional rigidity. From the dash forward the reinforcement takes the form of a channel plate within the side member channel. The same construction is also used on the 65.

"75" Brakes Same as "80"

The new internal brakes on the 75 are similar to those used on the Imperial 80. As on the other models, they are of Lockheed manufacture and of two-shoe design but those in the 75 have two-piece shoes with fixed anchor pins. The outer part of the shoe, carrying the molded lining, is pivoted at the center to the inner shoe and bolted. Brake drums are 14 in. in diameter and take $1\frac{3}{4}$ in. width lining.

In the engine the major changes are a slight increase in standard compression ratio with the "Silver Dome" head to 5.0 to 1, and the use of C.N.S. steel for the exhaust valves, this steel also being used for exhaust valves in the other chassis models when the high compression "Redhead" is used.

Other chassis changes include the adoption of double Timken bearings at the rear axle wheel hubs, taking the axle shaft thrust; $\frac{1}{4}$ in. longer lower king pin bushings, and the incorporation of thermostatically operated radiator shutters. The new tire size for this model is 6.00 by 18 in.

It is in the external appearance of the "75" that its most marked changes have been made. The frontal appearance of the radiator presents a massive area trimmed only by a narrow chrome-plated beading. The massive frontal effect is obtained by combining full depth vertical radiator shutters with a dummy extension of these shutters to cover the front of the header tanks at the top of the core.

This idea of almost entirely eliminating the radiator shell as far as visibility is concerned is also carried out on the sides. Here the hood overlaps the shell for nearly its entire width, leaving only a narrow beading to trim off the front of the car. Notches are cut in the top of the hood to fit around the chrome-plated extension of the header tank in which the filler cap is located. This design alone gives the impression of a massive and long front. It is further accentuated by raising the entire ensemble of radiator, hood, and cowl about 3 in., and blending the molding lines into the body in a horizontal sweep.

To still further increase the general massive, low-hung effect, the outside bottom line of all body sills has been dropped some $1\frac{3}{4}$ in. below the top of the frame, the doors as well as body panels extending down to this point. On the coupe models the same idea in design is responsible for the high rear deck found on the new models.

The 75 bodies should also be much sturdier and more free from noises than the former models with the increase in size and number of body brackets throughout and the use of rubber shims between frame and body sills. Some of the other new features of the bodies include aluminum drip moldings; a new instrument panel of black background with gold filigree decoration and nickle trim; a new type of Fedco serial number plate in a small oval in the center of the lower windshield cross bar; imitation walnut

garnish moldings on this cross-bar as well as on the window frames; dual cowl ventilators on all models; recessed lifting door handles on the open models; arched windows; shield over gas tank and frame horns, and cover for the gas tank gage, chrome plated; wider doors and a general increase of interior dimensions.

A number of individual features are offered in the various body models on the 75. The Royal Sedan is equipped with upholstered spring arm rests. It has a rigid robe rail and an inclined board-type foot rest. Its equipment includes a walnut smoking case, assist cords and silk draw shades. In addition to this same equipment, the Town Sedan has its front seat adjustable fore and aft a total of $3\frac{1}{4}$ in. A center armrest for the rear seat folds into the seatback. Corner lights, in addition to the dome light, are standard. In the coupe are a crank type regulator for the rear window of the front compartment; an inclined foot-rest for the rumble seat compartment, which also has a 2 in. wider seat; and a package compartment back of the front seat.

The new roadster body is $3\frac{1}{2}$ in. longer than that of the 72, and $3\frac{1}{2}$ in. wider at the door lock pillar. It is fitted with a one-piece folding type windshield, side cowl ventilators, a floating type of front seat construction, both cushion and seat-back moving in unison, and rigid frame type of curtains.

A number of the special features mentioned as being found on the 75 are characteristic of the entire new Chrysler line. To mention only a few, there are the cover plates over gas tank and frame horns; new hardware, chrome-plated; new lamps and arched tie rods; arched windows; better body bracing, and double filament headlights.

In the radiator shells of both the 65 and the Plymouth the shell is overlapped by the hood to obtain increased hood length. In these cars, however, radiator shutters are not used and the header tank at the top is chrome-plated. On both models the filler cap mounting and cap has been flattened out to a flush type mounting, with the wings swung down and straightened to accentuate the effect of speed.

Cowl lights are mounted on chrome-plated bands which inclose the wiring. Hood side panels have an embossed panel in which are the louvres, the panel having an arched top. Front corner pillars are smaller and automatic windshield wipers and stop lights are standard equipment on all models.

New Graphitic Steel

GUNITE is a new graphitic steel for which a number of applications already have been found in the automobile industry. It has been developed by research work carried on by the manufacturers, the Gunite Corp., Rockford, Ill., over a long period. It is a high carbon steel with graphitic carbon uniformly distributed by a precipitation process, and among its outstanding features are mentioned great strength, toughness, rigidity and resistance to wear.

Gunite is said to have proved the solution of many problems that have perplexed manufacturers of a wide range of products. Among the articles which have been improved by the use of Gunite may be mentioned brake drums, clutch plates, cams, pressing dies, large and small gears, surface plates, jigs, fixtures, bushings, heavy duty bearings, punch frames, bases, steam engine cylinders, pistons, rings, valves, gages and rollers.

Studebaker and Erskine Models Shown With New Bodies

*President engine has larger bore and 121-in. wheelbase line
is added with sedan at \$1,685. Ball bearing shackles
on all chassis. Steering column adjustable.*

By M. Warren Baker

NEW body designs, increased horsepower and speed in the President series, and a new low price of \$1,685 for the President sedan are among the changes announced by Studebaker today.

The President series now is available in two wheelbases, a 121-in. chassis having been added in five models ranging in price from \$1,685 to \$1,850. Prices throughout the five lines remain closely comparable to those of the former Erskines, Dictators, Commanders and 131-in. Presidents.

Principal differences between the latest offerings and their predecessors lie in the new standards of beauty and comfort. The outward appearance has been improved through the use of a higher and deeper radiator and new molding effects, while the interiors reflect the latest vogue in style and appointments.

Mechanically, few changes have been made. The engine in the President eight has been increased from 100 to 109 b.h.p. through enlarging the bore $\frac{1}{8}$ in. The new piston displacement is 336.6 cu. in. Other dimensions remain unchanged.

Fafnir ball bearing spring shackles have been adopted on the new cars. These shackles require no adjusting and call for lubricant at about 20,000-mile intervals.

The only other mechanical change is in the location

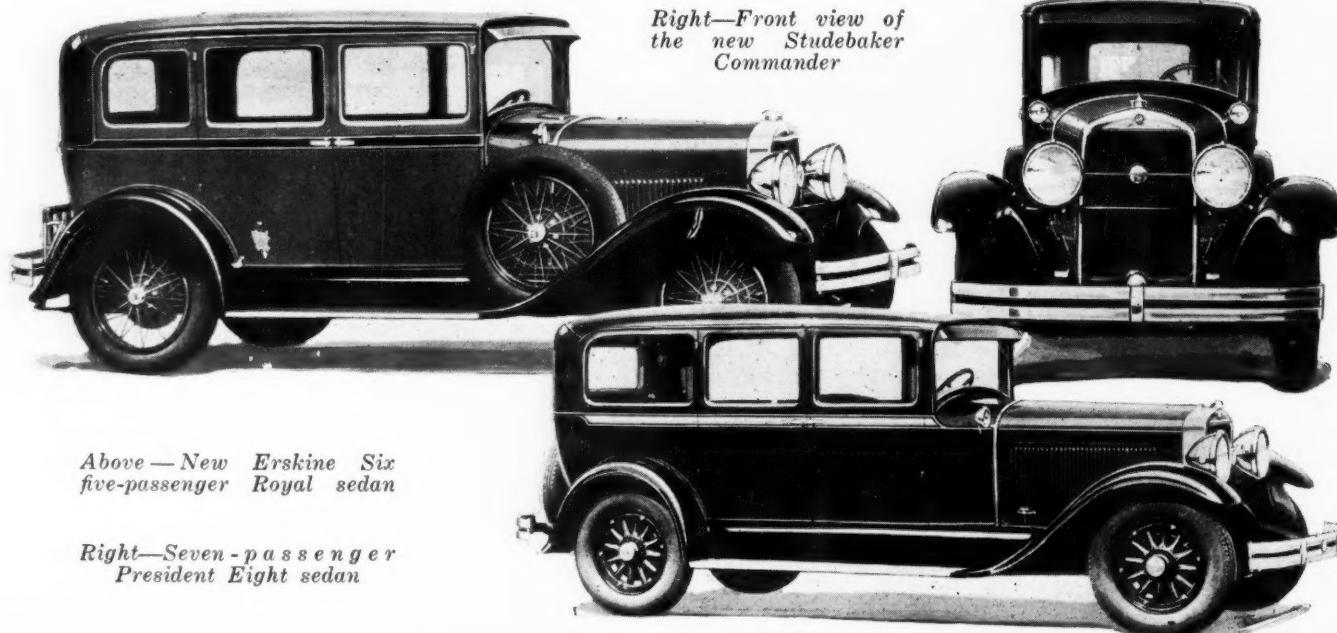
and drive of the water pump on the President models. The pump, formerly located at the front of the block and driven through the fan shaft, now is located on the left side of the engine and driven through the generator shaft.

Bodies in the new models are low and sweeping with deeply crowned fenders, swung low over the wheels. Radiator shells are of wider design and are chromium plated, as are the lamps, bumpers and other bright work. Roof lines are low and terminate in a "polo cap" visor.

New Radiator Cap

The new radiator cap is flatter and carries a "winged speed" motif in its design. Headlights and side lamps, mounted on a wide cowl surcingle, likewise are designated to this motif. Hub caps have been redesigned and finished in chromium, and new oval emblems, individual for each model class, have been placed in the headlamp tie rods.

A number of new color options are offered, including many shades recently sponsored by fashion authorities. Among those used are autumn brown, Deauville sand, dusk blue, Burgundy, suede gray, Damson plum, spirea green and port wine. Body panels are antiqued in several shades including Deauville, ivory



Above — New Erskine Six
five-passenger Royal sedan

Right—Seven-passenger
President Eight sedan

Right—Front view of
the new Studebaker
Commander

and Dauphin red, and stand out in pleasing contrast. Mohair, broadcloth, plush and whipcord in harmonizing shades are used on the various interiors, combined with advanced "form-fitting" cushion construction. The contours of the seat backs and cushions are fitted to the body in a degree never before accomplished in Studebaker productions.

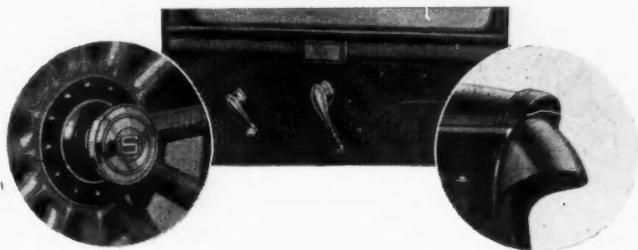
Butler satin-finish hardware, silk curtains at rear and quarter windows, antique finished door and instrument panels, large door pockets, heavy ornamental robe rails and ash receivers in the doors are found in various combinations on the closed models.

The President series cars have etched silver medallions for door panels, upholstered arm and foot rests, luggage grids, silk assist cords, cigar lighters, smoking sets and vanity cases. Royal, Regal and State models are equipped with six wire wheels, spares mounted in the fender wells, and trunk racks.

Steering wheels have been redesigned and are now of the flat type, made of hard rubber molded over a steel base. Steering columns are adjustable to suit the driver and light, ignition and throttle controls are mounted on top of the wheel. Gear shift lever and parking brake are mounted side by side, but set farther forward than in the earlier models, adding to comfort in entering or leaving the car.

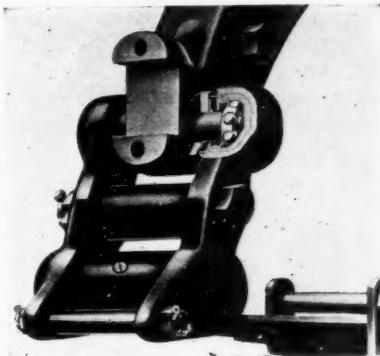
All models are equipped with twin-beam headlights, automatic windshield cleaner, coincidental lock, rear vision mirror, hydraulic shock absorbers, dash gasoline gage and rear traffic signal. An opal iridescent dome light is standard in the sedans and Victorias, while corner lights, operating from automatic door

switches, are carried in the seven-passenger closed models. An extra light has been placed on the instrument board to afford direct illumination of the coincidental lock.



Among the new Studebaker features are redesigned hub caps, antique door panels and "polo cap" sun visors

All instruments are grouped under directly lighted glass dials, each bordered with an etched silver frame. Instruments include gasoline gage, speedometer, oil pressure gage and ammeter on all models, and an engine heat indicator in addition on all President, Commander and Dictator models.



Fafnir ball bearing spring shackle as used by Studebaker

With the addition of the shorter wheelbase line, the President series now is available in 10 different models. Eighty miles per hour is the official claim for these cars.

Sport roadsters and cabriolets now are fitted with tops that harmonize in colors with the bodies. Cabriolets are finished in the front compartments, in broadcloth, mohair, or leather, with rumble seats in leather. Rear curtains have been redesigned to allow fastening against the ceiling in a few seconds, and liberal storage space has been arranged in all coupes, roadsters, cabriolets and Victorias.

THE 1928 Year Book of the American Engineering Standards Committee, recently released, indicates that 49 new standards were adopted during the past 12 months and 40 new standardization projects have been undertaken.

Of direct automotive interest is the new Safety Code for Colors for Traffic Signals, approved last year, while a new project still under way is that on a code of markings and signals for street traffic signs.

Of general interest to all industries is the approval of table of preferred numbers which has been recommended to industry for trial to determine if it will result in the decrease of waste through elimination of needless sizes as its use has abroad.

Other standardization projects of general interest referred to in the Year Book include standards for mathematical symbols, wire and sheet metal gages, pin and washer dimensions, transmission chains and sprockets, small tools and machine tool elements, ball bearings.

Studebaker-Erskine Prices

ERSKINE SIX

Sedan, Club	\$860
Sedan	945
Sedan, Royal, 6 wire wheels and trunk rack.....	1,045
Cabriolet, for 2	875
Cabriolet, Royal for 4, 6 wire wheels and trunk rack	995
Touring, 5-pass.	835

DICTATOR

Sedan, Club	\$1,185
Sedan	1,265
Sedan, Royal, 6 wire wheels and trunk rack.....	1,395
Victoria	1,345
Cabriolet, Royal, for 4, 6 wire wheels and trunk rack	1,395
Coupe, Business, for 2	1,265
Touring, 5-passenger	1,265
Touring, 7 passenger	1,325

COMMANDER

Sedan	\$1,495
Sedan, Regal, 6 wire wheels and trunk rack	1,665
Victoria	1,545

PRESIDENT, 121-IN. WHEELBASE

Sedan	\$1,685
Sedan, State, 6 wire wheels and trunk rack	1,850
Victoria, State, 6 wire wheels and trunk rack	1,850
Cabriolet, State, for 4, 6 wire wheels and trunk rack	1,850
Roadster, State, 5 wire wheels	1,850

PRESIDENT 131-IN. WHEELBASE

Sedan, 7-passenger, 4 wood wheels	\$2,085
Sedan, State, 5-pass., 6 wire wheels, 6 tires and trunk	2,250
Sedan, State, 7-pass., 6 wire wheels, 6 tires and trunk rack	2,350
Limousine, 6 wire wheels, 6 tires and trunk rack....	2,450
Cabriolet, for 4, 6 wire wheels, 6 tires and trunk rack	2,250
Touring, State, 7-pass., 6 wire wheels, 6 tires and trunk rack	2,485

Fault is Found With Present Fuel and Oil Tests

Speakers at A. S. T. M. meeting claim that some methods now used are of little or no practical value in determining how well gasoline and oils meet certain requirements.

By K. W. Stillman

CONSIDERABLE information regarding the properties of gasoline and lubricating oils which are really essential to proper operating conditions was presented at one of the sessions of the 31st annual meeting of the American Society for Testing Materials, held at Atlantic City last week.

The reports of the committee on petroleum products and lubricants, as well as two papers and the discussion which followed them during this session, brought out the fact that commonly accepted methods of testing gasoline and lubricating oils contain many tests which are of little or no practical value, and that certain requirements, essential to proper service of the materials, are not being determined by the present methods.

In explaining the "How and Why of Gasoline Performance," J. Bennett Hill, chief chemist, the Atlantic Refining Co., said that there are four qualities demanded in gasoline to provide maximum satisfaction but that, unfortunately, some of these are so directly opposed that present fuels can be no more than a compromise.

The first operating requirement for gasoline is easy starting with a cold motor. This requires rather high volatility at low temperatures or at the front end of the A.S.T.M. distillation curve. The second requirement is that, once the engine has been started, it shall continue to run with the choke pushed in as quickly as possible. This requirement appears to be the same as that of starting, but Dr. Hill pointed out that it was rather different and that the volatility of the middle fractions of the gasoline affected the warming up operation.

Acceleration and Volatility

The third requirement, that of acceleration, is also related to volatility, a relatively volatile gasoline being required to vaporize instead of throwing out liquid when pressure in the intake manifold is suddenly raised by opening the throttle valve.

These three requirements indicate that the greater the volatility of a gasoline the better, and up to a certain point, Dr. Hill said, this is true. Volatility is obtained by additional refining and added expense and with a decrease in the amount of fuel obtained from the same amount of crude. Many of the advantages of high volatile gasoline can and have been obtained through engine and carburetor design, as in the use of an accelerating well in modern carburetors, so that fuels of lower volatility will operate as satisfactorily as one of much higher volatility.

Finally, Dr. Hill pointed out that it is only by hold-

ing to present standards of volatility that the petroleum industry has been able to meet the ever increasing demands for gasoline at prices favorable to the motoring public.

Dr. Hill knocked in the head a prevalent fallacy when he said that pound for pound all gasolines give practically the same energy on burning and are, therefore, capable of identical mileages. Due to the slight variation in specific gravities a product with high specific gravity—low test gasoline—should give slightly higher mileage than high test gasoline with lower specific gravity.

Drivers Use Rich Mixture

The belief that there is considerable difference between the mileages of fuels is caused, Dr. Hill believes, by the fact that the driver seeks to compensate for hard starting and slow warming up of low volatile fuels by enriching the mixture and so sacrifices mileage in an attempt to mask qualities which are inherent in his fuel.

Robert E. Wilson, director of research, Standard Oil Co. of Indiana, created a bit of a stir with the paper prepared by him in conjunction with D. P. Barnard of the same company, when he attempted to classify commonly used motor oil tests according to their value in determining performance.

He divided the tests into four groups—those which are important in service; those which have little relation to performance but indicate contamination or inadequate refining; those that have little bearing on performance but may indicate the source of the oil, and those that were designed for other products but which are sometimes injudiciously applied to motor oils.

In the first group were placed just three tests—for viscosity and temperature coefficient of viscosity; pour test; and carbon residue. In other words, the authors contended that these three tests are sufficient to give all desirable information regarding the performance of any motor oil and that the many other tests commonly used, such as color, water and sediment, neutralization, gravity, sulphur content, emulsion, etc., render no real service in determining the most desirable item of information—how will the oil perform under operating conditions?

The paper stressed the importance of the temperature coefficient of viscosity inasmuch as automotive engine lubricants operate under a wide range of temperatures so that an oil whose viscosity changes as little as possible with temperature changes is highly desirable. This item has not been given the attention it deserves, the authors believe.

They also brought out the importance of considering dilution when viscosity is specified. Except for the equilibrium or prediluted type of oils the viscosity of an oil placed in an automobile engine, will, under average winter operating conditions, drop to one-half or one-third of its original value in about 200 miles of operation.

The pour test was suggested as of second importance to viscosity tests to determine the performance of oils for winter operation. Tests have shown that in engines equipped with fine oil screens, oil circulation does not begin at temperatures below the pour point of the oil in the crankcase so that it is important to have an oil with low pour point to insure proper lubrication when starting an engine in winter.

While surrounding conditions, such as the type and fit of pistons and rings, operating temperatures, viscosity of oil, etc., cause variations, the authors stated that tests show quite conclusively that there is a distinct relationship between the carbon residue value of an oil and the amount of carbon deposits in the combustion chamber.

In discussing the other tests which are rather commonly employed but which, the authors believe, have little or no relation to performance the real results to be expected from them were pointed out. Color tests are of value in checking uniformity of a given brand. Water and sediment indicate contamination in handling.

Corrosion tests they believe to be unnecessary as no evidence has ever been presented that the oil itself ever corroded engine parts. Tests for gravity and for flash and fire points may indicate source of the oil but the authors state that with modern test methods available source is not important criterion for satisfactory lubricants.

Other tests such as for sulphur content, unsaturation, emulsion, evaporation and precipitation should not be applied to motor oils, according to the authors, although they may be very useful in testing other materials.

Despite the number of tests commonly employed but which are of doubtful value, there are still two properties of oil which have come to be considered of importance but for which no standard tests have been devised. These are for resistance to oxidation and for oiliness.

Describes Rubber Test

In another session of the convention, Harlan A. Depew, New Jersey Zinc Co., told of methods devised by his company for abrasion testing of rubber such as is used in tire treads. The investigation indicated that the abrasion of a tire under normal operating conditions is not a fundamental property but is the resultant of resistance to cutting and to tearing.

A test machine was developed which, in the first design, simply passed test pieces of rubber across an abrasive track, but which was later modified so that the test pieces were alternately lifted and dropped under pressure upon the abrasive track. The first design resulted in cutting action while the final design was more of a tearing action and abrasion resistance determined from the latter machine was in good accord with actual experience with rubber of various cures.

W. H. Parker, American Chain Co., read a paper in which was described the methods developed for testing the wearing qualities of tire chains. The device permits the specimen to be tested to be held at constant pressure against the face of a rotating grinding wheel the surface of which is kept continuously dressed. Comparative results were obtained by recording the number of revolutions required to produce a given depth of wear in the test specimen.

While this method could not be relied upon entirely to reproduce service conditions, it was found, in general, that the correlated results of the laboratory tests gave reliable indexes of the service qualities of chains, and furnish a quick method of comparing materials, heat treatments, etc.

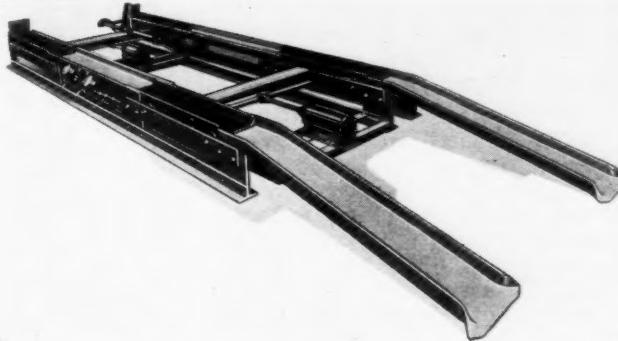
Other papers presented at the convention of indirect interest to automotive men were numerous and covered many metallurgical fields. Some of the subjects treated in these papers, which are available through the A.S.T.M., were "The Static and Fatigue Properties of Some Cast Irons"; "The Effect of Sulphur on the Physical Properties of Gray Iron"; "Calibration of Rockwell Hardness Testing Machines"; "Endurance of High Speed Steels in Relation to Magnetic and Other Measurements"; "Some Factors Involved in Corrosion and Corrosion Fatigue of Metals"; "The Seizing of Metals at High Temperatures," and "Some Mechanical Properties of Nickel, Manganese-Nickel and Copper-Nickel Alloys."

Raybestos Brake Tester

RAYBESTOS CO., Bridgeport, Conn., has designed and is marketing a new type of brake tester which is said to closely reproduce actual road conditions. This is brought about by sliding the "road," represented by movable platforms, under the wheels to represent the sliding of the wheels over the road in service.

In testing, the car is driven up ramps onto the tester, which requires no pit. Each wheel rests on a movable platform. The brakes are set to any desired degree and then the platforms are moved under the wheels by means of compressed air cylinders. Braking resistance is measured either by the amount of pressure required to move each platform or by the time required to move it.

As air is admitted to the pistons the amount of pres-



Raybestos brake testing device

sure is registered on a gage. When one of the platforms overcomes the resisting force of the brake the pressure drops slightly but quickly builds up again until another platform gives way and so on until all four have moved to their limit of travel.

When the test for stopping the car going forward is completed a similar test may be made for rearward braking efficiency by moving the platforms ahead under the wheels.

This type of equipment makes it easily possible to equalize the two front brakes, the two rear brakes and to obtain any desired ratio between the two pairs.

The length of the new equipment is 21 ft., its width 5 ft. 8 in., and its height 16 in. It weighs about 2000 lb., and obtains its power from an air compressor with accumulator tank of 5 cu. ft. displacement at 100 lb. pressure.

AUTOMOTIVE NEWS SECTION INDUSTRIES

Philadelphia, Pennsylvania

July 7, 1928

Production and Sales Hold Well Above Level in 1927

PHILADELPHIA, July 7—Production and sales of motor cars continue to run well above the level of last year at this time and are at or close to the record high marks for the early summer season. Although there has been the usual tapering off at some of the factories, three of the leading plants have swung into active production of new models.

Fewer announcements of new lines have been made than was expected earlier in the year, in several instances the producers having found sales holding up so well that no need for renewed stimulus to the market was felt. Although the lower-priced cars have been showing greater gains over last year than those in upper and medium price brackets, the prosperity of the industry has been rather unusually diffused over price classes and in no particular territories has severe curtailment of demand been noted. Lower priced eights have shown outstanding popularity, affecting to some extent some higher priced sixes.

Profits have been strengthened by the large volume of business, by slightly lower prices of some important raw materials, and by the firm maintenance of the price structure. In a few instances prices of important models have been slightly raised without, apparent-

(Continued on page 34)

French Exports 12,109 in First Four Months

PARIS, June 26 (*by mail*)—French automobile exports for the first four months of the present year totaled 12,109 passenger cars and 1777 trucks and tractors. The greatest volume of business was done with Algeria, which purchased 2727 passenger cars, followed by Spain with 1857, and Great Britain with 1118.

Automobile imports during the same period totaled 2603 passenger cars and 118 trucks and tractors. Italy headed the list with 1255 passenger cars, the United States coming second with 897. The declared value of the Italian cars, which were largely composed of small Fiats, was 11,985 francs, whereas the American cars had a value of 25,992,000 francs.

Canton Bolt Changes Name

CANTON, July 2—The Massillon Rivet & Mfg. Co. today has succeeded the Canton Bolt Co. and the plant of the company has been moved to Massillon. Facilities for the manufacture of small rivets have been greatly increased and the company is now in position to furnish all styles and sizes of small rivets by the cold process.

G.M. Sales in June Again Above 200,000

NEW YORK, July 3—Figures reported by the various units indicate that General Motors sales to consumers for the month of June will be well in excess of 200,000, making the third consecutive month in which the 200,000 mark was broken. May sales were 224,094 and April sales 209,367. June sales in 1927 were 159,701. Exact figures will be compiled and issued by General Motors Corp. some time toward the middle of the month.

Minnock Joins Chevrolet

MINNEAPOLIS, July 5—Peter F. Minnock of Detroit has succeeded L. B. Barnes as manager for Chevrolet in this territory. Mr. Barnes, who was assistant manager four years and manager five, has been transferred to Washington.

J. J. Raskob's Son Dies

WILMINGTON, July 5—William F. Raskob, 20 year old son of John J. Raskob, chairman of the finance committee of General Motors Corp., was killed instantly in an automobile accident north of Centerville, Md., at 2.30 p. m. today. He was one of 12 children. With his brother, John J. Raskob, Jr., he was a student at Yale University and was spending his summer vacation at the Raskob summer home at Centerville.

Adds Steel Wheel Building

DETROIT, June 30—Motor Wheel Corp. will construct a \$100,000 addition to its Gier pressed steel wheel unit at Lansing. The corporation has been operating at a capacity basis for several months and now has 2253 employees on the payrolls.

Weeks Heads U.S. Fastener

BOSTON, July 2—Sinclair Weeks has been elected president of the United States Fastener Co. F. A. Ives has been named vice-president, and George S. Maynard has been named treasurer.

Bureau of Standards Develops New Meter

WASHINGTON, July 5—Creation of a new meter, which measures automobile engine speed 25 times a second, is enabling the Bureau of Standards to discover the degree to which low test gasoline will permit acceleration, the Department of Commerce announces. The device consists of a tape on which electric discharges at the rate of 25 times a second record the engine speed and it has been discovered already, the bureau announces, that certain types carburetors with "wells" allow good pick-ups with low test gasoline fed at lean mixture.

Traffic Code Committee Meeting in Washington

NEW YORK, July 5—The committee on uniform municipal traffic ordinances and regulations is meeting in Washington the last three days of this week. Thursday will be devoted to the meeting of the sub-committee on drafting and Friday and Saturday will be given over to the meeting of the committee as a whole.

Representatives of the automotive industry who will attend this meeting include William E. Metzger, vice-president, Federal Motor Truck Co.; John C. Long, secretary, street traffic committee of the National Automobile Chamber of Commerce; David C. Fenner, chairman, Motor Vehicle Conference Committee; probably C. A. Vane, general manager of the National Automobile Dealers Association, and others.

Kelly Sails for U. S.

PARIS, June 26 (*by mail*)—H. H. Kelly, automotive trade commissioner to Europe, will sail for the United States on July 4, with the intention of visiting New York and Detroit. Mr. Kelly states that the trip will be a hurried one, for he intends to be back in Paris before the end of July.

Enlarge Aero Quarters

NEW YORK, July 3—The Aero-nautical Chamber of Commerce reports that its activities have increased to such an extent that it has had to enlarge its quarters. It has moved to larger space on the seventh floor of the building it formerly occupied at 300 Madison Avenue.

Many Plants Show High June Output

Production in First Half Carried Over 1927 Total by Continued Demand

NEW YORK, July 5—Unofficial estimate of production in June places the total at 440,000, this including the production of cars and trucks in the United States and Canadian plants. Production in May was 459,932, the second highest month on record, and in June last year was 341,154.

DETROIT, July 5—Continued high production in most of the leading plants in June brought total output in that month close to a record for the month and has brought the total for the first six months well in advance of the 1927 totals. Increasing output of Ford Motor Co. and the starting of production by several makers on new models were instrumental in bringing the month's total to high point.

Record monthly outputs were reported by a number of manufacturers in the smaller production group and Chevrolet Motor Co., which has been the leader for more than a year, reported an approximate 128,000 for a record June. The May output was 140,700 and the June, 1927, total 110,000. For the six months Chevrolet has built approximately 780,000 cars and trucks.

Hudson Motor Car Co. built 31,160 cars in June, comparing with 32,450 in May and with 23,084 in June last year. For the six months the Hudson total is 183,065, as against 168,336 in the first half of 1927.

June shipments by Olds Motor Works totaled 11,360, a record for the month and comparing with 11,716 in May. Total shipments for the first six months of the year were 50,088, a new high for this period.

Hupp First Half 38,423

Hupp Motor Car Corp. shipments in June totaled 5110 against 8361 in May and 2879 in June last year. Shipments for the first half of the year totaled 38,423 against 22,310. The company had 1338 unfilled orders on its books July 1.

Reo Motor Car Co. shipments in June totaled 6133 against 6121 in May and 4479 in June last year. The six months' total is 26,031 against 25,657 in the same period last year. Unfilled orders on July 1 totaled 2569.

Graham-Paige Motors Corp. output in June totaled 8829, a gain of 318 over May. Production from Jan. 7, when new cars were introduced, to June 30, totaled 38,745, more than three times the total of 11,409 for the first six months of 1927. To maintain production, night shifts are at work in several departments.

Durant Motors, Inc., shipped 15,109 cars in June, an increase of 83½ per cent over shipments of June, 1927, in which month were shipped 8231 cars. For the six months this year Durant Motors shipped 69,130 cars, an increase of nearly 49 per cent over the six months of last year in which were shipped 46,430 cars.

Sales figures by Willys-Overland show slightly more than 200,000 cars marketed in the first six months of 1928, which compares with 171,743 in all of 1927. The June total was the largest for that month in company history, exceeding June, 1926, and June, 1927, combined.

Libbey-Owens Plans Non-Shatter Glass

TOLEDO, July 3—First unit of a new laminated glass plant here is now being started by the Libbey-Owens Sheet Glass Co. It will have a capacity for 10,000,000 sq. ft. of non-shatter glass annually, it has been announced by James C. Blair, president of the company. The company has had large automotive contracts and for some months has been furnishing considerable glass for Ford Motor Co. Eventually it is planned to have three units here and the total investment in this phase of the company's business will be more than \$3,000,000.

Belgian Manufacturers Plan Plate Glass Rise

WASHINGTON, July 5—An increase of from 10 to 15 per cent in the price of plate glass is being considered by Belgian manufacturers, according to a report from Consul Burdett at Brussels, to the Department of Commerce. During the first five months of this year, the consul reports, the Brussels district exported from Belgium more than \$1,380,000 worth of plate glass, destined for ports of this country. The Belgian output of plate glass is reported now very near to capacity.

Chrysler Sees Outlook Good

DETROIT, July 3—Walter P. Chrysler, president of the Chrysler Corp., said today that the outlook for second-half business throughout the industry was good. Mr. Chrysler participated in the ceremonies opening the company's new engineering building.

Crossley Buys Lycomings

PHILADELPHIA, July 5—The European order for 2000 engines received by Lycoming Mfg. Co., previously reported as coming from Vauxhall, was received from Crossley.

Seiberling to Build on Coast

SAN FRANCISCO, July 5—Seiberling Rubber Co. will establish a new factory on the Pacific Coast, probably at San Francisco or Oakland, according to F. A. Seiberling, president.

Business in Brief

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co.

NEW YORK, July 5—Trade activity appears to have relaxed slightly during the past week, partly by reason of seasonal influence and partly because of continued bad weather, particularly in the South and Southwest and in some parts of the corn belt. Considerable rain has fallen in sections where it was not needed by the crops and where it has interfered to some extent with business.

FREIGHT CAR LOADINGS

The railway freight movement is also fairly encouraging. Although the number of cars loaded during the week ended June 16 was 13,187 less than in the corresponding period last year, it was 7332 more than in the preceding week. For the year to date, loadings total 22,467,267 cars, as against 23,481,542 a year ago.

BANK DEBITS

Bank debits to individual accounts outside of New York continue to run above the totals for 1927, though by a smaller margin than in recent weeks. The amount of such payments in the week ended June 27 was less than 5 per cent above that a year earlier, whereas the aggregate for the first half of the year is 8½ per cent in excess of the total for the similar period last year.

In financial market there was no sign of disturbance as a result of the nomination of presidential candidates. This upward movement was, however, abruptly checked on Monday of this week by a general decline of quotations, attributed to the sharp advance in the call money rate to 10 per cent, the highest level reached since November, 1920.

FEDERAL RESERVE REPORT

The recession in speculative activity was again reflected in a decline in the amount of brokers' borrowings in New York during the week ended June 27. This was the third successive decrease in the Federal Reserve Board's weekly report, and carried the total down to \$4,159,000,000, as against \$4,563,000,000 on June 6.

This decline, together with a drop of \$13,000,000 in investments of reporting member banks as a whole, was partially offset by an increase in security loans outside New York, so that total loans and investments decreased only \$48,000,000. Discounts of the Federal Reserve banks increased \$41,000,000, nearly regaining the high level for the year reported a fortnight earlier, while open market holdings of the Reserve banks declined slightly, leaving a net increase of \$30,000,000 in the amount of Reserve credit in use.

FISHER'S INDEX

Commodity prices recovered further last week, but still remain below the year's peak. Professor Fisher's weekly index now stands at 98.4, as against 97.9 a week ago and 98 four weeks ago.

Dealer Tax Refund About \$10,500,000

Estimate is Based Upon Refund in 1926 When \$7,534,813 Was Returned

WASHINGTON, June 30—Repeal of the 3 per cent excise tax on passenger cars, which went into effect May 29, 1928, will involve a refund of approximately \$10,500,000 to the automobile dealers on cars then in stock, according to best estimates available by the Internal Revenue Bureau.

The estimate is based upon figures just compiled by the Bureau, showing that the reduction from 5 to 3 per cent in the excise tax which went into effect March 28, 1926, resulted in a refund of \$7,534,813.

The completed inventory shows that on March 28, 1926, there were 55,445 automobile dealers in the country. At midnight on that date, they had the following stock on their floors:

Complete automobiles.....	430,259
Automobile bodies	323
Automobile chassis	406
Motorcycles	913
Total	431,901

The figures under the 1926 act shows that the 71 passenger car manufacturers of that date paid back \$7,482,765 to dealers. In addition to this sum, there were claims for refunds totaling \$101,137, making the total amount paid under the 1926 act \$7,534,813.

So accurate was the 1926 inventory made by the 55,445 dealers that but \$71,951.32, or less than 1 per cent, was found to be erroneously inventoried.

Based on the former figures, wherein the tax was reduced from 5 to 3 per cent, or a net reduction of 2 per cent, the Government estimates that the increased reduction of 3 per cent will yield a total refund to the dealers of the country of \$10,000,000 to \$11,000,000.

The Department announces that inventory blanks, forms and other necessary blanks have already been supplied to dealers and that as rapidly as the dealers prepare the inventory it will be checked by an agent of the Treasury Department and it is expected that the total refund can be made within 90 days.

Cadillac Wins Prizes

DETROIT, July 2—At the International Automobile Show beauty contest just held in Berlin, by the German Automobile Club, Cadillac received three first prizes, three seconds, one third and one fourth, and also the Berlin Tageblatt's special prize for most beautiful car of all classes.

Favors Ohio License Law

COLUMBUS, July 2—The Ohio State Safety Council, composed of safety supervisors and manufacturers

interested in safety measures, at its annual meeting held in Columbus, June 25, adopted a resolution favoring the passage of the drivers' license law for motorists at the coming session of the Ohio General Assembly. The council went on record as favoring other safety measures but placed special emphasis on the drivers' license law.

Dodge Stock Depositing Now Extended to July 10

NEW YORK, July 2—Following dismissal of the proceedings to restrain the transfer of control of Dodge Brothers, Inc., to the Chrysler Corp., the time for filling deposits of stock has been extended to July 10. The committee has received more than 83 per cent of the outstanding preference stock and more than 73 per cent of the Class A common stock.

Victory Roadster \$1,245

DETROIT, June 30—Dodge Brothers, Inc., has introduced a roadster model in the Victory Six line listing at \$1,245. It is available in several color combinations and six wire wheels with the two spares carried in fender wells and a trunk rack at the rear are standard equipment. The car is upholstered in pigskin.

Moon Building New 6

ST. LOUIS, July 2—The 1929 series of Moon Aerotype eight-cylinder cars is in production along with a six-cylinder car, which follows the Aerotype principle and which will be on display shortly, officials of the Moon Motor Car Co. have announced.

Louis S. Clarke Tells of Early Difficulties and Successes, in Opening Autocar Exhibit

ARDMORE, PA., June 30—Motor vehicles of the earliest type, even antedating the "horseless carriage," are included in the permanent exhibit assembled in the new display room at the Autocar factory. The first motor-propelled Autocar, which was really a tricycle, is shown there. The "horseless carriage" is also represented by an Autocar model of the year 1897.

This new display room was formally opened Thursday when Autocar served lunch to more than 100 members of the Rotary and Kiwanis Clubs of Ardmore and vicinity.

Following a brief word of welcome by R. P. Page, Jr., president of Autocar, R. T. Anthony, secretary, introduced Louis S. Clarke, founder of the Autocar company.

Mr. Clarke related some of the early difficulties encountered back in 1897 when he first set out to build a "horseless carriage." The problems of carburetion and ignition were paramount. At first, carburetion was obtained by forcing air into the gas tank and thus utilizing the evaporation for engine combustion. It was not until 1899 that

New Highways Open Mexican Town Sales

Smaller Communities in Market for Cars—Elections to Aid Business

LAREDO, TEX., July 2—During May a total of 660 automobiles were shipped from the United States to Mexico through this port of entry, according to figures just issued by the National Railways of Mexico. While the official figures of imports through other border gateways and ports are not available here, it is stated that the total number of cars shipped to Mexico from this country during May was approximately 1800.

Dealers of all the larger cities report a notable improvement in the trade and business conditions generally. It is expected that when the presidential situation is definitely settled, a still further improvement will take place.

One of the interesting phases of the automobile trade at this time is the demand for cars in the smaller communities. This is accounted for largely by the construction of highways. The Mexico City-Acapulco highway has given a transportation outlet to a number of smaller towns, and a surprising number of orders for automobiles have been developed.

Young Gets Radiator Contract

RACINE, July 2—Young Radiator Co. has received a one-year contract from the Chicago Pneumatic Tool Co. for manufacture of its complete line of radiators used for portable compressors.

Charles E. Duryea discovered the principle of the constant level float feed carburetor which was largely responsible for the success of automotive transportation. Mr. Clarke exhibited one of the first carburetors ever built.

He closed his talk by telling of the endurance run from New York to the Pan-American Exposition in Buffalo in September, 1901. Mr. Clarke entered this run with a chain-driven Autocar and drove it himself, accompanied by a mechanic. It was a period of unusually heavy rains and the dirt roads of that era were heavy and almost impassable. Chain trouble developed so frequently that almost as much time was spent by Mr. Clarke and his mechanic down in the mud under the car, adjusting chain trouble, as was occupied in driving. The Autocar won the event but the experience convinced Mr. Clarke that only an enthusiast like himself would undergo such troubles to drive an automobile and something more efficient must be substituted for chain drive. In the following December he exhibited the first shaft-driven automobile in America.

Steel Output Gains in First Half-Year

Automotive Demand for Sheet and Strip Main Factor in Showing

NEW YORK, July 5—Amid the usual dullness of Fourth of July week, the steel market finds comfort in the findings of statisticians that production during the year's first half broke all records and, so one authority declares, was 3 per cent ahead of the first six-months' record of both 1927 and 1926. Last year's second half showed a decline of approximately 20 per cent in operations from the first half; in 1926, the second-half dipped only about 10 per cent under the first-half operations.

When detailed figures are available, it will be found that automotive demand, as indicated by sheet and strip-steel consumption, will have been chiefly responsible for the steel industry's favorable showing during the year's first half. The paramount question in the steel producer's mind just now as to how sharp the tapering-off in second-half volume business will be is usually answered by an appraisal of the outlook in the automotive industries.

Prices have given way no further and the demand for full-finished sheets continues more active than had generally been looked for. Some finishers continue to complain that body-builders are too exacting in their inspection of sheets and that this cuts down considerably more their profit margin than is generally thought. Sheet bar prices have settled on a \$33 basis, billets being quoted at \$32, Pittsburgh. Semi-finished material in a form more economical for non-integrated strip-mills than the market now affords will, according to some reports in the trade, be added in the near future to standard descriptions of semi-finished steel. A veteran authority on steel says it may be called "strip mill breakdowns."

Orders for cold-finished steel bars indicate that consumers are even more than before wedded to a hand-to-mouth buying policy. The market for automotive alloy steels reflects the more leisurely pace in operations of high-priced motor car manufacturers. Bolt and nut demand is light.

Pig Iron—Quite a little irregularity is noted in the pig iron market. Here and there concessions from the going quotation of \$16.75 for Valley foundry are uncovered. Ohio and Detroit quotations remain nominally unchanged, but the tone of all the markets is decidedly easy.

Aluminum—So far nothing has developed to indicate any immediate change in market conditions.

Copper—Consumers appear to have provided for their needs during the month just begun, and relatively little interest is shown in more deferred deliveries. Prices are unchanged.

May Excise Receipts Reflect Sales Gains

WASHINGTON, June 30—A total of \$6,172,923 in excise taxes was collected from automobile purchasers in May, compared with \$5,435,101 in May, last year, according to figures of the U. S. Bureau of Internal Revenue. The law was repealed at 8 a.m. on May 29. Total receipts from July 1, 1926, to May 31, 1927, were \$58,796,670. Receipts from July 1, 1927, to May 29, total \$51,450,701, a net decrease in the automotive excise tax of \$7,345,968.

Tin—Tin deliveries in the United States last month aggregated 6950 tons, according to New York Metal Exchange statistics the highest tonnage for June on record. This indicates that the low prices which have prevailed in the tin market have led to considerable buying.

Lead—The market shows no change.

Zinc—With the shut-down of the Joplin district mines this week, the market rules quiet, but firm.

Ohio Steel to Expand Automobile Sheet Plant

CLEVELAND, June 30—Directors of Otis Steel Co. have authorized an immediate expansion program made necessary by the large and increasing demand for the company's full finished automobile sheets. The plans contemplate extensive additions to the soaking pit and blooming mill unit at the Riverside Works, to be completed in 90 days. This will provide heating capacity for 7200 additional tons of steel ingots monthly and a corresponding increase in semi-finished products.

The finished sheet output will be increased by 2000 tons monthly by expanding the normalizing furnace equipment. This part of the program will be completed by Sept. 1.

The company's output of normalized automobile sheets is booked solid through July, and there is only a small tonnage available for the last week of August, according to President E. J. Kulas.

Midland Adds Brake Output

DETROIT, June 30—Midland Steel Products Corp. plans an immediate increase of 30 per cent in production of automobile brakes. Output for the first half of the year was about 400,000 brakes.

Moore Buys Waller Equipment

WATERLOO, IOWA, June 30—Dies and patents of the Waller Mfg. Co., which recently went into bankruptcy, have been purchased by the Moore Mfg. Co., makers of automobile trunks, bumpers, heaters and other automotive accessories.

Studebaker to Give Retail Sales Medals

Factory Extends Service Awards to Dealer Organization to Encourage Constancy

SOUTH BEND, July 2—Studebaker Corp. of America has now extended the awarding of medals to veteran members of Studebaker dealers' sales forces. According to Paul G. Hoffman, vice-president of the corporation, dealers' salesmen will receive medals on the following basis:

Bronze medals for five years' continuous service.

Bronze medals for 10 years' continuous service.

Silver medals for 15 years' continuous service.

Gold medals for 20 years' continuous service.

A total of 10,838 service medals have been awarded to Studebaker employees in South Bend and Detroit factories, according to Mr. Hoffman. These were distributed as follows: 346 employees were given gold medals for 20 years or more of continuous service; 547 were given silver medals for 15 years of continuous service; 1779 have received bronze medals for 10 continuous years of service and 8166 have been decorated with bronze medals for 5 years continuous service. Of the 346 employees who received gold medals, 99 have served Studebaker for 25 or more consecutive years.

Graham Division Offers New Line of School Buses

DETROIT, July 2—Introduction of a new line of six-cylinder Graham Brothers school buses with carrying capacities of 18 to 52 children and having improved safety features, riding comfort and increased power, has been announced by the motor coach division of Dodge Brothers, Inc. Four-wheel Lockheed hydraulic brakes and four-speed transmission are features of the new buses.

A full vision windshield affords the driver unobstructed view at all times. The entrance door is on the right front side, and is controlled by a lever which can be operated only by the driver. An emergency door at the rear is equipped with a safety device to prevent unauthorized opening, and the rear step folds up when not in use. Sales of Graham Brothers school buses in 1927 increased 36 per cent over 1926 and further increases are expected.

Sales Increase 20.2 Per Cent

DETROIT, June 30—Foreign and domestic sales of Dodge Brothers, Inc., from Jan. 1 to June 23 showed a gain of 20.2 per cent over the corresponding 1927 period. Retail sales gained 57 per cent in the week ended June 23 compared with a year ago.

Men of the Industry and What They Are Doing

N.A.P.A. Names Harrington Merchandising Director

Frank M. Harrington of Philadelphia has been appointed merchandising director of the National Automotive Parts Association. Mr. Harrington formerly was district manager of the Celoron Co.

"Increasing N.A.P.A. sales and a growing appreciation of the necessity of personal sales direction in the distributing division of our organization governed the creation of this new department of our association now headed up by Mr. Harrington," Charles H. Davis, executive secretary of N.A.P.A., declared in making the announcement of Mr. Harrington's appointment. "No manufacturer or group of manufacturers can expect their jobbing outlets to attain satisfactory efficiency in the merchandising of parts in these days of intense competition and rapidly changing conditions without having closer personal contact with those jobbing outlets."

National uniformity of discounts to the various classifications of trade, maintenance of legitimate prices and personal assistance to weaker distributors will claim the major attention of this new N.A.P.A. official.

Galt and Wilson Join Briggs

Hugh Galt, formerly associated with the art and color section of General Motors Corp. as designer, is now serving in a similar capacity with the art department of the Briggs Mfg. Co. J. M. Wilson has joined the newly organized designing staff at Briggs, his former connections being with General Motors and the studios of Le Baron-Detroit.

Henry Again Heads A.A.A.

Thomas P. Henry has been reelected president of the American Automobile Association for his sixth term. George W. White of Washington was reelected treasurer, and Charles C. Janes, Columbus, was reelected secretary. William E. Metzger was elected a member of the executive committee.

Gardner Joins Comtor

Henry Gardner, formerly consulting engineer with the Steammotor Co., Chicago, has become associated with the Comtor Co., Waltham, Mass., as vice-president and treasurer. He will be engaged in introducing the Comtor system to the many industries interested in modern quick precision methods of interchangeable production.

Henderson Takes Position

H. M. Henderson, formerly of Henderson Bros. & Co., Inc., is now in charge of the crude rubber department of Harriss, Irby & Vose, New York.

Guaranteed Mileage Menace—Firestone

PORTRLAND, ORE., June 30—"The greatest menace to the tire industry today is guaranteed tire mileage," declared Harvey S. Firestone, during his address here today before an assemblage of Firestone dealers.

"Advertised mileage and time guarantees are unfair and misleading to the public. This is the next problem which the Rubber Institute of America will undertake to solve. It will attempt to have all legitimate tire manufacturers dispense with this system of merchandising."

Vail on European Trip

E. D. Vail, vice-president of the Jaeger Watch Co., New York, maker of the eight-day Swiss-American time-piece for motor cars, sailed for Europe on June 30, for his annual visit to his foreign factories and European service stations. Jaeger factories are located in Switzerland, Paris and London and service stations are maintained in such additional cities as Brussels, Berlin and other metropolitan centers.

Hayes Sells Holdings

H. J. Hayes, president of the recently organized Victor Body Corp., Lansing, has disposed of his interests in the Hayes Body Corp., of Grand Rapids, of which he was formerly president. His holdings were acquired by other stockholders in the Hayes company. Besides disposing of his interests he has also resigned as a director.

Sampson Gets Promotion

F. W. Sampson has been appointed engineer in charge of the shock absorber division of Continental Motors Corp., according to Col. George W. Blackington, head of the shock absorber division. Mr. Sampson has been with the company for four years.

Splitdorf Names Representatives

J. H. Weatherly has been appointed sales representative of Splitdorf Electrical Co. in Indiana, Wisconsin, Illinois and Iowa. A. M. Nichols has been appointed to the sales department in the Kansas City territory.

Fowler Returns From Europe

T. F. Fowler has returned from a two months' trade survey of the automobile industry in England and the European continent.

British Equipment Dealer Visits American Plants

J. C. Pitchford, managing director of Richard Lloyd & Co., Ltd., Birmingham, England, is making an extended tour of the United States and is visiting numerous companies in this country from which his firm receives automotive and other merchandise.

While stopping at the South Bend Lathe Works, in South Bend, Mr. Pitchford said: "I have enjoyed this first trip to the United States very much and everywhere I have stopped the people have been exceptionally friendly. I have felt perfectly at home ever since I landed. Business seems to be in good shape here as far as I can see. In my own country things are forging ahead and trade is more brisk. The outlook appears to me to be very good, here and in England."

Mr. Pitchford left South Bend for other principal cities in the Middle West and South, having on his itinerary the sources of supply of his company.

British Ad Man to Speak

J. Heritage Peters, who is to be one of the speakers at the International Advertising Association convention at Detroit in July, is head of the Heritage Peters Advertising Service, Ltd., of Coventry, England. This organization is the largest advertising agency in Great Britain, specializing in engineering, mechanical and technical products. He will discuss the peculiarities of the British market and will illustrate how American advertising has to be refashioned to appeal to the British reader.

Mulloy Leaves U. S. Rubber

John H. Mulloy, retiring superintendent of the United States Rubber Co., Detroit plant, was paid high tribute at a banquet in his honor June 29, at Detroit. Mr. Mulloy completed 34 years' service with the United States and its predecessor, the Morgan & Wright Co. He will become vice-president and sales manager of the Organ-Oxide Products Co.

Letts Visits Pontiac

Sir William Letts, president and managing director of Willys-Crossley Co., Ltd., of Manchester, England, was in Pontiac the week of June 30, where he was the guest of D. R. Wilson, vice-president and general manager of the Wilson Foundry & Machine Co.

Lindbergh P.R.R. Adviser

Colonel Charles A. Lindbergh has accepted a position as adviser to the Pennsylvania Railroad on aeronautical engineering problems, according to General W. W. Atterbury, president. The appointment was effective July 1.

Pierce-Arrow Deal Awaits Stock Vote

Studebaker Would Invest \$2, 000,000 and Would Hold All Class B Stock

BUFFALO, June 30—Reorganization of the Pierce-Arrow Motor Car Co. under a plan which would give the Studebaker Corp. of America a substantial interest in the new company, was proposed to stockholders of the Pierce-Arrow Motor Car Co. this week by directors of the Buffalo company.

The Studebaker Corp. will throw the weight of its selling organization behind the new company. A. R. Erskine, president of Studebaker, will be chairman of the board of the new company, and Myron E. Forbes, president of the Pierce-Arrow Motor Car Co., will be president. A. J. Chanter, manager of Studebaker branches, has been assigned to work with the Pierce-Arrow Sales organization starting at once.

The directors voted to recommend to stockholders for action at a special meeting July 25, a plan for the reorganization of Pierce-Arrow Co. and consolidation with a new company to be formed in which Studebaker Corp. will invest \$2,000,000 in junior securities. Under the terms each holder of the present 8 per cent stock of Pierce-Arrow will receive for each share and all unpaid dividends \$10 per share in cash and 8/10 of a share of 6 per cent preferred of the new company.

The Studebaker Corp. will invest \$2,000,000 cash in the new company and will receive 230,125 shares of Class B stock.

The capitalization of the new company is to be as follows: 8 per cent sinking fund gold debentured, \$3,349,200; preferred stock, with a par value of \$100 a share, 80,000 shares; Class A stock of no par value 197,250 shares and Class B stock of no par value, 230,125 shares.

The present capitalization of the Pierce-Arrow Co. is \$10,000,000 (\$100 par) 8 per cent cumulative preferred stock authorized and outstanding and common stock of no par value, 328,750 shares.

Will Create Sinking Fund

"The preferred stock," says the statement outlining the business of the merger, "is entitled to 6 per cent cumulative dividends from March 1, 1929, is redeemable as a whole or in part on any quarterly dividend payment, at 105 and accrued dividends, will have the benefit of an annual sinking fund of 3 per cent commission July, 1930, to be applied to the purchase or redemption of preferred stock, and except as otherwise provided in exhibit B has no voting rights unless four quarterly dividends are in arrears. The Class A stock is entitled to a \$2 per share and the Class B stock is entitled to share in all further dividends declared in

any year, half at the rate per share paid on Class B stock.

"The Class A stock is redeemable as a whole or in part at any time to and including Dec. 31, 1932, at \$40 per share, at any time thereafter at \$40 a share plus \$2 for each full calendar year commencing with Jan. 1, 1932, in which the net earnings as designed in said exhibit B equal or exceed one and a half times the requirements for the \$2 dividend on the Class A stock outstanding at the end of such year less the amount of such dividends paid on the Class A stock on or after Jan. 1, 1933; provided that said redemption price shall not be less than \$40 per share nor more than \$46 per share, each share of Class A stock has one vote on all matters and each share of Class B stock has two votes on all matters."

Packard Earnings Total \$17,803,304 for 9 Months

DETROIT, June 30—For the nine months ended May 31, Packard Motor Car Co. earned \$5.92 a share against \$3 a share in the previous corresponding period. Income rose to \$17,803,304 from \$9,023,325. Net profit for the quarter ended May 31 jumped to \$7,662,769 or \$2.55 a share, from \$4,607,267, the preceding quarter, or \$1.53 a share.

In a letter to stockholders President Alvan Macauley said that Packard Motor Car Co. does not intend to lose its identity through any merger, combination or consolidation, now or hereafter. The company, he states, "is not opposed to expansion and may, from time to time, expand by absorption of other desirable companies."

Hayes-Hunt Discontinued

ELIZABETH, N. J., June 30—Operations of the Hayes-Hunt Body Corp. will be discontinued at once, and the making of bodies for Durant cars and trucks will be taken over by Durant Motors, Inc., according to T. S. Johnston, assistant to W. C. Durant. The Hayes-Hunt company has been housed in the Durant plant here and held a participating contract under Durant.

Griswold in New Plant

DETROIT, July 2—Griswold Motor Body Co. has moved its painting and trimming departments to the plant formerly occupied by Rickenbacker Motor Co. on Twelfth St., and is now building 50 bodies a day. Robert Fell has been appointed superintendent in charge of this plant.

Mason Receiver Named

CLEVELAND, June 30—P. W. Eigner has been appointed receiver for the Mason Tire & Rubber Co. on petition of J. B. Ricker of Kent, Ohio, who alleges the company has no tangible working capital. The petition gives current assets of \$1,500,000 and current liabilities of \$600,000.

Financial Notes

H. H. Franklin Mfg. Co. has resumed dividends on the common stock with the declaration of a disbursement of 50 cents a share, payable on July 20 to stockholders of record July 10. This will be the first payment made on the stock since July 11, 1921.

Common stock outstanding numbers 299,345 shares, while the preferred shares total 58,867,516. Cash and marketable securities on June 25 totaled \$2,435,498. The financial strength of the company is shown by a ratio of seven to one of assets against liabilities as of May 31. The company has not borrowed money since May 7, 1927.

Cincinnati Ball Crank Co. is offering 45,000 shares of participating and convertible preference stock at \$33.50 a share. Of the shares offered, 10,000 will be purchased from the company to provide funds to retire the present outstanding 7 per cent preferred stock and to reimburse the company for expenditures made for additions to plant now being completed.

Hupp Motor Car Corp. has declared a quarterly dividend of 50 cents and a regular stock dividend of 2½ per cent, payable Aug. 1, to stockholders of record July 14. Cash dividend compares with former cash dividends of 35 cents a share, placing the securities on a \$2 annual basis as compared with the previous \$1.40 basis.

Alloy Steel Spring & Axle Co., which has acquired all assets of the National Plating & Enameling Co., of Jackson, Mich., has placed privately 28,125 units of "A" and "B" stock through R. W. Halsey & Co., and Nicol-Ford & Co., at \$20 a share. Alloy Steel has been the principal customer of National Plating.

Evans Auto Loading Co. directors have voted to declare either a 100 per cent stock dividend or to give two shares of new common stock for each share of Class B stock outstanding. A special stockholders' meeting will be called to act upon the proposal.

Motor Products Corp. for the first five months of 1928 showed net profit of \$922,765 after interest, depreciation, Federal taxes, etc., against \$318,421 for the corresponding period in 1927.

Chisholm-Moore Division Elects Officers and Board

CLEVELAND, July 2—Following news of the recent purchase of the Chisholm-Moore Mfg. Co., Cleveland, by the Columbus McKinnon Chain Co., comes the announcement that the former company will hereafter be known as Chisholm-Moore Hoist Corp. (Division of Columbus McKinnon Chain Co.)

The following directors and officers have been elected: Directors: Julius F. Stone, Julius F. Stone, Jr., J. C. Dunn, A. L. McKinnon and Frederick Mitchell. Officers: Julius F. Stone, president; Julius F. Stone, Jr., vice-president; J. C. Dunn, vice-president and treasurer; Frederick Mitchell, secretary. John R. Mears continues as sales manager of the new corporation.

Retail Car Stocks Reduced in June

(Continued from page 28)

ly, causing any disturbance to the demand for the product.

Light trucks are selling very well—approximately at last year's level despite the very meagre output by Ford. Heavy-duty truck sales are still unsatisfactory, but do not appear to be running behind the rate of last year at this time.

Reports from leading centers follow:

Boston

Motor car sales during June were better than in May in the Boston territory. The weather began to warm up and those who had been holding off showed less resistance to salesmen. The swing of sales showed an upward curve in May and this continued into June. When June began the registrations showed that for the first five months in 1928 there were 48,776 new cars listed or 6726 more than the same period of a year ago. Stocks in the hands of dealers are not heavy.

New York

June trading in both new and used cars is far ahead of last year. Sales of new cars during the first two weeks of the month, according to Sherlock & Arnold, were 7465 as compared with 6329 for the same two weeks in 1926. Dealers are not heavily loaded with either new or used cars. Some used car managers are even complaining that they cannot meet the demand for used cars. New car stocks also are light.

Atlanta

Though automobile sales in the southeastern territory during June compared favorably with sales for the same month in 1927, business continues less active than it was earlier in the season with the possible exception of the Chevrolet and Ford. The Chevrolet plant in Atlanta produced about 6000 cars in May and June production has been very close to capacity which is 350 cars per day, while the Atlanta Ford plant also is running at almost capacity. The reason for the decline in sales of most cars compared with the earlier part of the season is due to the fact that general business and industrial conditions are less satisfactory and there seems to be little promise of improvement during the summer. Stocks of new cars are larger and used car stocks are exceptionally heavy. Truck sales in June continued to hold their own and are reported by larger distributors to have gained substantially over the same month.

Cleveland

Dealers have succeeded in materially reducing their stocks of both new and used cars during the last two weeks of June. New models have stimulated sales. The used car market is "better than fair," Herbert Buckman, secretary of the Cleveland Automobile Manufacturers & Dealers Association, said.

Detroit

Indications are that retail sales of automobiles set a new June record. Reports from various state points indicate a continued heavy demand for both passenger and commercial cars. While many dealers have large stocks of used cars the demand for this class of vehicle is also strong and the used car situation is considered except-

tionally favorable. As an example of the sales, Detroit will register approximately 10,000 sales during the month, compared with 6230 in June last year.

Chicago

New car sales during June were reported by the majority of dealers in the Chicago territory as being approximately 10 per cent greater than for May, and from 15 to 20 per cent greater than in June last. Year stocks of new cars on the whole are below normal, but owing to the unusually severe weather during the month stocks of used cars remained on a par with May, which for June might be considered abnormal. Ford deliveries are rapidly increasing but dealers still are from two to three months behind on orders.

Milwaukee

With passenger car business being freshened up materially by the announcements of 1929 models by factories making this a practice, it is confidentially expected that July will turn up a volume comparable to that of 1927. In addition, the increasing Ford production is making its impress, and numerically, sales are continuing to show increases. Sales of used passenger cars have increased moderately, despite the fact that dealers are insisting on favorable prices. Motor truck business is comparable to a year ago. The majority of Milwaukee dealers entered July with low stocks of new cars.

St. Louis

Sales of new cars improved during June despite an unusual period of rain and bad weather. Used car sales kept pace with the new car business, each exceeding May business and sales in June, 1927, by about 15 per cent. Used car stocks are lower than at the same time last year, but the number of new cars in warehouse are greater than during June, 1927.

Kansas City

There has been a slight slowing down of automobile sales in June but this is seasonal. Most dealers say business is better than a year ago. Ford deliveries are increasing. The stock of new cars in the hands of dealers is, in most cases, unusually low. The same is true of used cars. There are less than half the used cars in the hands of new car dealers than is usual at this time of the year with the sale continuing strong. The wheat crop in Kansas, Oklahoma and Nebraska soon will be on the market and this is expected to greatly stimulate sales throughout the territory.

Denver

Car sales slow for June. The season is retarded all over the state and is much less than June last year. The used car stocks are about the same, but much too high. Going easy on new cars, and collections are slow with some acceleration during the last 10 days.

Minneapolis

"We're sitting on top of the world," is the phrase of one automobile distributor in describing the car business in the Northwest. A general rain has put a rosy tint on the crop situation, and although a general rain muddles up the unpaved highways and delays business some, what the deal-

ers want is a good fall crop. New car stocks have not been so low for a long time and there are distributors who are not yet able to fill present orders. The used car situation has kept pace with the new car business and stocks are low and handled easily. Some used cars already have been turned in to apply on new models of lines not yet announced.

Cincinnati

Although sales of new and used cars will show a falling off in June as compared with May, the demand is well ahead of last year and the total for the month will be 25 per cent in excess of 1927 if the ratio continues. In a few instances, dealers are slightly handicapped over inability to secure new cars in sufficient quantity and in no case is there an unusual surplus. The used car situation generally is satisfactory.

New Orleans

Increase of about 6 per cent in value of automobiles sold this month over the same month last year is reported. The new Fords are meeting with great favor here. The used car market is now in bad shape on account of new Fords. There is a marked trend from heavy to light trucks. The automotive business in general is picking up, the passage of the flood control bill has helped considerably.

Dallas

Good grain crops well near harvested and prospects of a good crop, coupled with good stocks of snappy new models at interesting prices sent June new car sales to new high levels for the year. The automotive business generally in Texas and parts of Oklahoma, Louisiana, New Mexico and Arizona showed a good increase over June a year ago and good business is expected during the summer. Actual sales of new cars were 5 per cent better than for May. Dealers have normal stocks, but used car stocks are fairly heavy.

San Francisco

June new car sales probably 10 per cent better than those of May and 15 per cent over June a year ago. The delay in Ford deliveries materially helps sales of other low-priced cars. Used cars, except rebuilds and guarantees, slower than ever and trucks up to two tons are selling about normal for this season, but larger sizes are not moving. General business conditions are better than last month and collections are about 6 per cent over those of June a year ago.

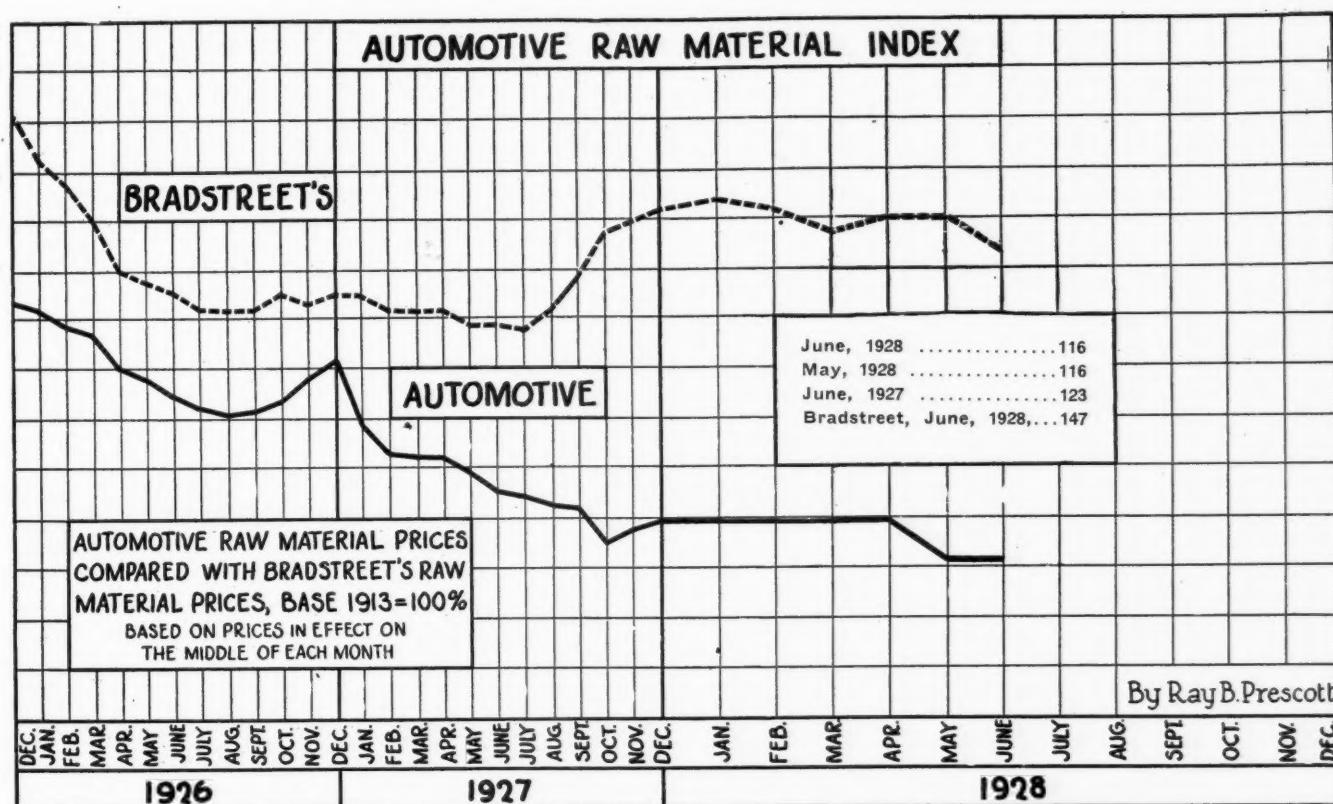
Los Angeles

Southern California shows improvement but June total will fall under June last year. Stocks in dealers' hands are fairly high and used cars are moving well. General business is reasonably good and truck market shows considerable improvement.

Seattle

New car sales for June showed a gain of approximately 15 per cent over the same month last year. Indications point toward an increase of from 5 to 10 per cent in total sales for the first six months, as compared with the same period in 1927. The used car market is in the best shape in years, dealers getting higher prices and selling 50 per cent more cars than last year.

Raw Material Prices Hold May Level



National Air Transport Shows Increase in May

CHICAGO, June 30—Air mail, air express and air passenger business on the National Air Transport, Inc., lines between Chicago and New York and Chicago and Dallas showed a steady increase during the month of May as compared with the preceding month.

During the last month National Air Transport planes handled 66,787 lb. of air mail, approximately 3,005,415 letters, as compared with 59,303 lb. in April, or an increase of 7484 lb. Air express for May totaled 7794 lb., as compared with 4820 lb. in April, an increase of 2974 lb.

Sixty-two passengers were handled during the month, as compared with 26 in the previous month, an increase of 36 people.

Foundry Companies Join

DETROIT, June 30—The Ypsilanti Foundry Co. and the Central Specialty Co., of Detroit, have consolidated and the new firm will be known as the Central Specialty Co. with offices in Ypsilanti. The entire plant will be expanded and modern equipment installed. A large portion of the Detroit plant will be moved to Ypsilanti. Total assets are \$750,000.

I.H.C. Increases Tractor Output

ROCK ISLAND, June 30—The Farmall plant of the International Harvester Co. has gone on a production basis of 125 tractors a day, E. H.

Sohner, general manager, announced this week, and the force at the plant has been increased to 1700. The production schedule places the Rock Island plant among the largest tractor factories in the country, although the Chicago and Milwaukee plants, which make a heavier machine, are producing 130 a day.

Durant Lansing Plants to Build 1000 Cars Daily

LANSING, June 30—Reports which credited W. C. Durant with the statement that the headquarters of Durant Motors, Inc., would be centered in Lansing have been denied by company executives in New York, according to newspaper dispatches. It was explained that the Durant company is spending \$1,250,000 in extensions in the hope that it will give the Lansing plant a daily output rate of 1000 vehicles. The company will also manufacture bodies in Lansing to eliminate freight handling from New Jersey.

Willys Adds 1516 Dealers

TOLEDO, July 2—New dealers appointed by Willys-Overland this year total 1516, according to the sales department. New dealer contracts continue to be signed up at a rate consistent with the growth since the first of the year and all points report an oversold condition on nearly all models. In the week ending June 17 there were 77 new dealer contracts signed and there is a large list of dealer applications on file.

German Builders Discuss Des Moines Plane Plant

DES MOINES, June 30—Karl Glauner, German airplane designer, representing a trio of German plane builders, was in conference with the Des Moines Industrial Bureau this week upon plans for the launching of a factory here for the manufacture of a two-passenger ultra-sport monoplane, patterned after the German Klemm, which was lately flown at Curtiss field. Henry Bolte, Des Moines insurance man, is interested in the project and Mr. Glauner, who will be general manager and wing designer, will have Fred Huep, whose sport plane designs have won wide attention, and Dr. I. G. Lachman, codesigner of the slot-wing, associated with him. A small light plane, equipped with engines of from 60 to 90 hp. of long cruising range, will be built and it is hoped to expand factory facilities if business warrants.

Hungary Adds Luxury Tax

WASHINGTON, June 30—The Department of Commerce is advised that Hungary has placed new luxury tax rates on automobiles with motor trucks and motor buses exempt. The rates are graduated from 5 per cent on automobiles less than 14 hp. to 15 per cent on automobiles of more than 24 hp. A 10 per cent rate is fixed on automobiles of from 14 to 24 hp. Parts of such automobiles are taxed from 5 to 15 per cent and motorcycles are taxed 5 per cent. This luxury tax is levied on the "c.i.f." value at port of entry plus duty.

G.M. Canada Builds Half-Million Cars

OSHAWA, ONT., June 30—Marking a milestone in the history of Canada's automotive industry, the half-millionth Canadian-built General Motors car rolled off the assembly line at the Oshawa plant of General Motors of Canada this month. Production of the 500,000th car followed closely upon a month in which it is reported, all monthly, weekly and daily records for production, shipments and sales were decisively broken. Two General Motors of Canada plants—one at Oshawa, the other at Walkerville—failed to catch up with orders.

"It has taken 20 years for General Motors of Canada to attain the half-million mark," pointed out J. H. Beaton, general sales manager. "While it took us more than 16 years to produce the first quarter million cars, the last quarter million has taken less than four years to make."

Gisholt Entertains Foremen

MADISON, WIS., June 30—The Chicago superintendent and foremen's club of the National Metal Trades Association was the guest of the Gisholt Machine Co. June 23. Short talks were given by Gisholt executives on equipment and trade practices.

Santiago Seeks Truck Bids

WASHINGTON, July 5—The Department of Commerce announces that the municipality of Santiago, Chile, will open bids for 87 trucks of 1½-ton capacity to be used for street cleaning service in that city, immediately.

Auburn Locates K.C. Branch

KANSAS CITY, July 2—H. S. Lowe, president of Auburn Distributors, Inc., has sold his company to the Auburn factory and Kansas City will become a direct factory branch.

Coming Feature Issue of Chilton Class Journal Publications

Oct. 10—Marketing Annual for 1929—Motor World Wholesale.

Cleveland Sales Increase for June and First Half

CLEVELAND, July 3—Marked increase in sales of new and used cars in June compared with the corresponding month in 1927, was reported by Herbert Buckman, Cleveland Automobile Manufacturers' & Dealers' Association. New passenger car sales totaled 4402, compared with 4022 for June, 1927. Commercial car sales were 345, against 272 in June, 1927. Movement of used cars was 14,493, compared with 13,059 for the same month last year.

New car sales for the first half of 1928 totaled 20,932, while the six-months' record of 1927 was 20,080. Used car sales for the corresponding periods were: 1928—69,936; for 1927—67,059.

Dealers report low stocks of both new and used cars.

Fort on Export Trip

SAN FRANCISCO, July 5—James H. Fort, vice-president of Fageol Motors Co., Oakland, has left this city on a foreign trade tour which will take him to every port on the Pacific, including the South Sea Islands, and from which he will not return until the end of June, 1929, and may remain away for a year from that date. He will visit the Pacific coast ports and commercial centers of South America, the Hawaiian Islands, Australia, New Zealand, the Dutch East Indies, the Philippines, China, Japan, and the Straits Settlements.

Thompson to Build \$750,000 Additions

CLEVELAND, July 5—Thompson Products, Inc., will spend \$750,000 for factory additions in Cleveland and Detroit to take care of production schedules which are outgrowing the company's present capacity.

The first of three new Cleveland units costing \$500,000 is now under construction and will be operating by Sept. 1. The remaining two Cleveland units, to be erected during 1929, will be devoted to machining and heat-treating.

A contract has also been let for the first of two Detroit units which will be especially equipped for large production orders of drag links and tie rods. The second Detroit unit, to be put up in 1929, will house a battery of forging machines and two oil-fired boilers.

Mr. Thompson estimated that completion of the company's building program would increase the capacity of the two plants 35 per cent to 50 per cent. He gave evidence for the need of this by citing production and sales records of the company during the past few years. The total number of pieces turned out by the Cleveland plant for original equipment and replacement during 1927 showed an increase of 56 per cent over 1925, and production for the first six months of 1928 is 82 per cent of all of 1927, the company's biggest previous year. Gross sales figures show proportional increases.

Replacement Sales Increase

Records of the replacement division alone indicate a still greater growth, with 1927 gross sales over three times those of 1925. The first six months of 1928 increased 74 per cent.

Sales in 1926 at the Detroit plant increased 22½ per cent over 1925, and 1927, 33 per cent over 1926. The first six months of this year are 50 per cent better than the same months of 1927.

Calendar of Coming Events

SHOWS

- American Electric Railway Ass'n, Public Auditorium, Cleveland...Sept. 22-28
- American Road Builders Association, Inc., Cleveland Auditorium...Jan. 14-19
- American Society for Steel Treating, Commercial Museum, Philadelphia.....Oct. 8-13
- American Welding Society, Commercial Museum, Philadelphia.....Oct. 8-12
- Automotive Equipment Association, Coliseum, ChicagoOct. 22-27
- BerlinNov. 8-18
- BrusselsDec. 8-19
- *Chicago, National, Coliseum.Jan. 26-Feb. 2
- International Aeronautical Exposition, Grand Palais, Paris....June 29-July 15
- LeipzigAug. 26-Sept. 1
- London, passenger carsOct. 11-20
- National Standard Parts Association, Cleveland Auditorium...Oct. 29-Nov. 3
- *New York, National, Grand Central PalaceJan. 5-12
- Paris, passenger carsOct. 4-14
- Paris, trucksNov. 15-25
- PragueSept. 1-9
- Salon, Automobile Salon, Inc., Hotel Drake, ChicagoJan. 26-Feb. 2
- Salon, Automobile Salon, Inc., Hotel Biltmore, Los Angeles.....Feb. 9-16

* Will have special shop equipment exhibit.

- Salon, Automobile Salon, Inc., Hotel Commodore, New YorkDec. 2-8
- Salon, Automobile Salon, Inc., Palace Hotel, San Francisco...Feb. 23-Mar. 2

CONVENTIONS

- American Electric Railway Ass'n, Public Auditorium, Cleveland...Sept. 22-28
- American Gear Manufacturers Association, Statler Hotel, Buffalo, N. Y., Oct. 11-13
- American Road Builders Ass'n, Inc., Cleveland AuditoriumJan. 14-19
- American Society for Steel Treating, Commercial Museum, PhiladelphiaOct. 8-13
- American Welding Society, Commercial Museum, Philadelphia.....Oct. 8-12
- Automotive Equipment Association, Coliseum, ChicagoOct. 22-27
- National Association of Automobile Show and Association Managers, Before-Shows, Drake Hotel, ChicagoJuly 26-27
- National Safety Council, National Congress, New YorkOct. 1-5
- National Standard Parts Association, Hollenden Hotel, Cleveland, Oct. 29-Nov. 3

S. A. E. National

- Chicago, Aeronautic MeetingDec. 6-7
- Detroit, Book-Cadillac, Production MeetingNov. 22-23
- Detroit, Book-Cadillac, Annual MeetingJan. 15-18
- Los Angeles, Aeronautic Meeting, Sept. 13-14
- Newark, Robert Treat Hotel, Transportation MeetingOct. 16-18
- New York, Annual Dinner, Hotel AstorJan. 10

RACES

- BelgiumAug. 12
- GermanyJuly 15
- Great BritainSept. 22
- ItalySept. 2
- SpainJuly 29